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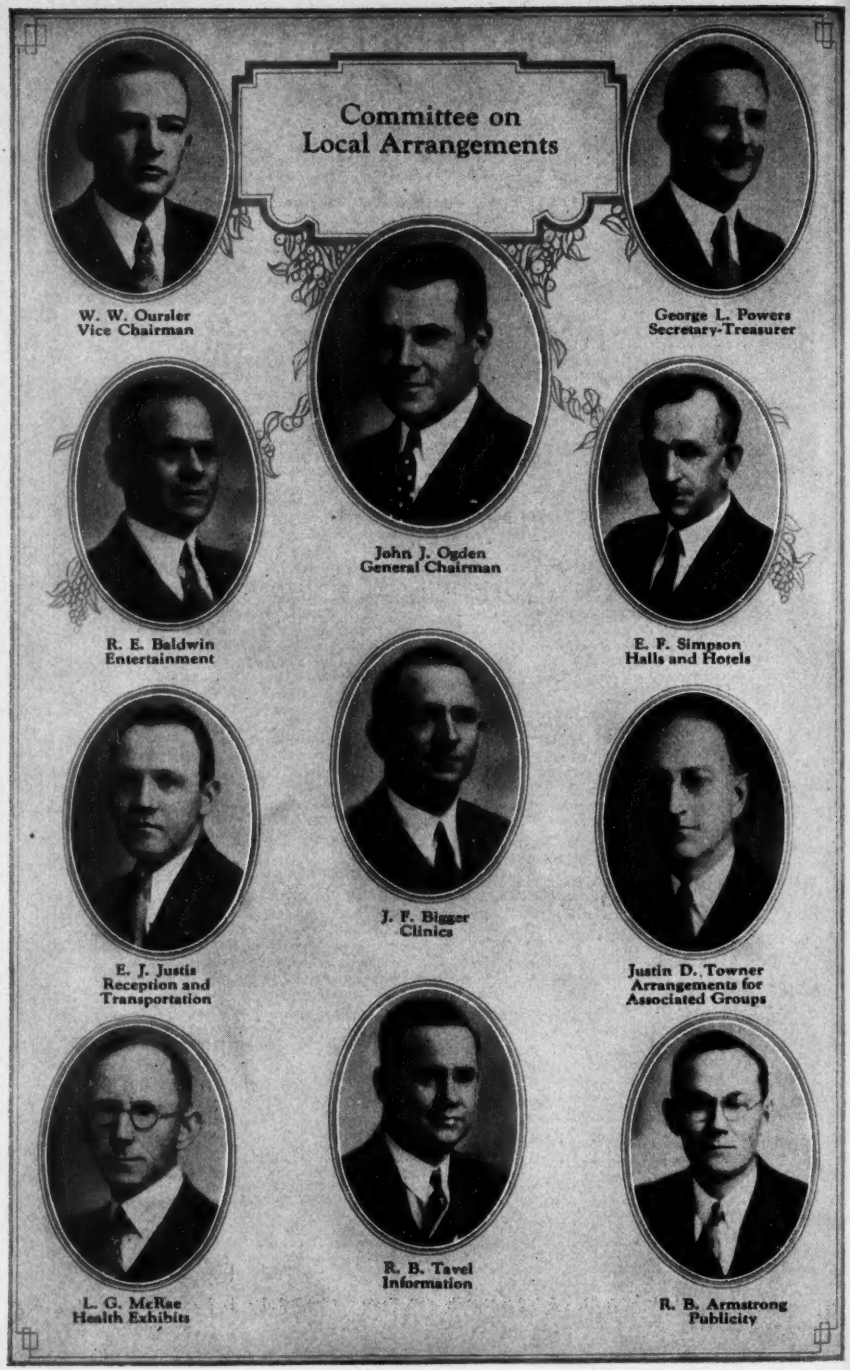

COMMITTEE ON LOCAL ARRANGEMENTS
SEVENTY-THIRD ANNUAL SESSION, AMERICAN DENTAL ASSOCIATION
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Original Communications

A COMPARISON OF NORMAL AND PATHOLOGIC BONE IN THE ALVEOLAR PROCESSES OF THE MAXILLAE*

By JOHN ALBERT MARSHALL, D.D.S., Ph.D., San Francisco, Calif.

THE formation and destruction of alveolar bone around the roots of deciduous and permanent teeth is dependent on several conditions divisible into two main classes, systemic and local.

Under normal conditions of growth, nutrition and freedom from tendencies toward hereditary or acquired infections, the usual bone building and bone destroying processes proceed without significant interruption. But when disease of either metabolic or bacterial origin is present, abnormal bone may be formed. When this occurs, the abnormality is not limited to variations in formation. It may include bone resorption, particularly that associated with the loss of deciduous teeth. For example, I reported in 1923[1] that deciduous teeth of dogs were retained over a considerable period of time when the animals were fed unbalanced diets. In the control animal, all the permanent teeth had erupted at the time of necropsy, but in others of the same litter on experimental foods, not only were the permanent teeth much slower in erupting through the gum, but also the deciduous teeth were retained. Thus, the animals on unbalanced diets had in the jaw at one time two nearly complete sets of

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*Aided by grants from the American Society of Orthodontists and the Board of Research, University of California.

*From the George Williams Hooper Foundation for Medical Research and the College of Dentistry, University of California.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 23, 1930.

1. Marshall, J. A.: J. A. M. A., 81:1665 (Nov. 17) 1923.

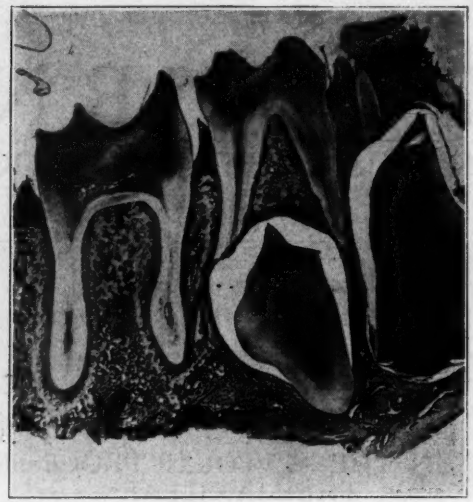

Fig. 1.—Longitudinal section of mandible of macacus rhesus; showing deciduous second molar and developing second bicuspid.

Fig. 2.—Longitudinal section of enamel organ, dentin and dental papilla in mandible of macacus rhesus.

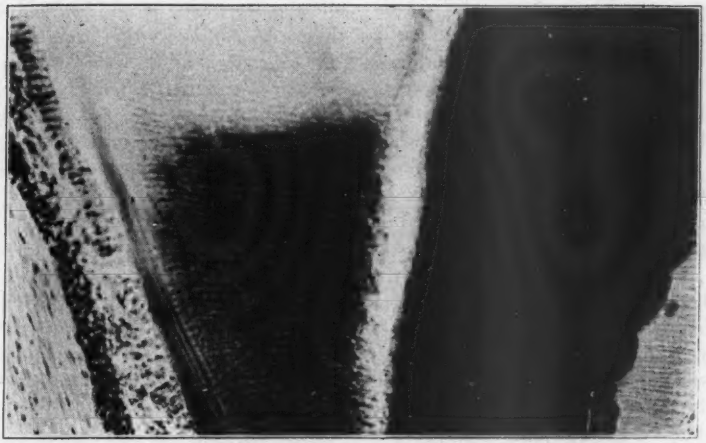

Fig. 3.—High magnification of specimen marked at lower left border of enamel organ at *A* in Figure 2. To the right of the picture is shown a portion of the predentin; then follow the dentin matrix, dentino-enamel junction, enamel matrix and enamel organ.

Fig. 4.—Ameloblastic layer and actively functioning ameloblasts. (×950.)

erupted teeth. These abnormalities were further discussed and illustrated in a later communication.[2] Since then, evidence has been accumulating from other experiments—on the macacus rhesus—that this same phenomenon occurs when either dietary or local conditions, or both, are abnormal.

A comparison of these variations is suggested in the accompanying illustrations. In Figure 1, resorption on the mesial and distal roots of a mandibular left deciduous first and second molar is shown. In this instance, no unusual stress had been applied to the teeth in question, and, furthermore, the animal was on a full diet. Since this specimen presents anatomic characteristics similar to others prepared from normal animals, it may be assumed that the true histologic picture is here represented. It will be noted that the ameloblastic layer of the forming permanent tooth encroaches closely on the roots of the deciduous tooth above it. The mesial root presents a different picture from that of the distal one. In the first place, the teeth, namely, the first and the second bicuspids, are in the process of development on either side of the root. In the second case, the formation of the approximating tooth, the first permanent molar, has been completed. When the radicular surfaces of the deciduous second molar are examined, it will be observed that in the case of the mesial root, resorption has proceeded on its distal aspect nearly half of the total root length, but, with the distal root, this does not obtain. The alveolar bone separating the developing bicuspids is less than half the thickness of the bone between the erupted first permanent molar and the developing second bicuspid. Both resorption and apposition are proceeding simultaneously in the jaw; for, in one case, both tooth root and alveolar bone are being broken down, and, in the other, active tooth and bone formation is going on. This is exemplified particularly in the second permanent molar.

The relation of the enamel organ, both to the developing tooth and to the deciduous one, is shown in Figure 2. The clear space above the dentin represents the enamel. As a result of decalcification, to which the jaw was necessarily subjected before it could be sectioned, this tissue was dissolved, and thus a portion in the block was left without any tissue.

The character of the bone immediately adjacent to the forming tooth is of especial interest. Here, the trabeculae are thinner and the spaces between them much larger. In contradistinction to this is the picture of active tooth formation. In Figure 3, on the extreme right, is a small zone of normal predentin matrix. Next to the predentin is normal decalcified dentin, then follows the dentinoenamel junction, enamel matrix and layer of actively functioning ameloblasts. In each of these tissues, the outstanding characteristic is the regularity in the arrangement and size of the fibers. In cases of hypoplasia, as will be indicated in a subsequent paper on the subject, this regularity does not exist. The layer of ameloblasts is shown in Figure 4, at a magnification of 950 diameters.

Attention is next directed to the histopathologic picture of cementum and dentin resorption occurring as a normal process on the roots of deciduous teeth. An earlier communication[3] reviewed the fact that the loss of deciduous teeth is a

2. Marshall, J. A.: Effects of Nutritional Disturbances on Calcification and Decalcification of Teeth in Experimental Animals, J. A. D. A., 11:6 (Jan.) 1924.

3. Marshall, J. A.: Pacific Dent. Gaz., 36:597 (Oct.) 1928.

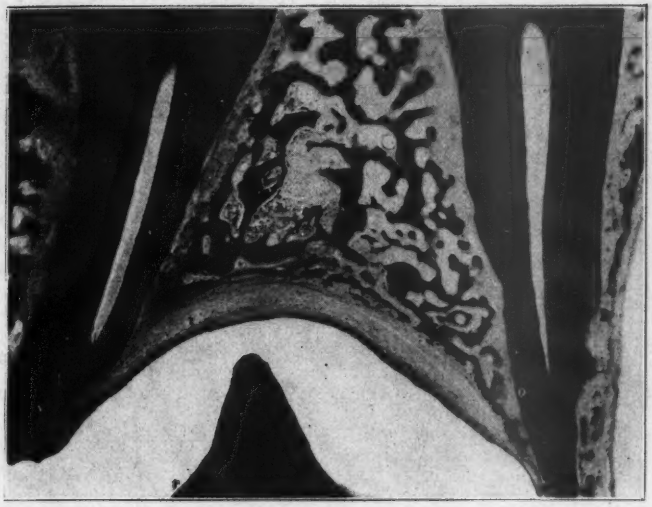

Fig. 5.—Longitudinal section through roots of deciduous molar and developing bicuspid. The irregularity in the outline of the canal as well as the loss of radicular substance on the periphery of the root is shown.

Fig. 6.—Radicular dentin from deciduous tooth in which active resorption is occurring. The great branching of fibers in the resorbed area is characteristic of this process. (×700; Schmorl's stain.)

Fig. 7.—Radicular dentin from deciduous root in unresorbed area. There is a marked difference in the branching and interlacing of the fibers. (×950; Schmorl's stain.)

Fig. 8.—Longitudinal section of mandibular permanent central incisor, showing a chronic apical abscess which developed as result of fracture of root sustained by animal in fight with cage mate. (Mallory stain; 42 mm. obj., 8× ocular.)

physiologic process; whereas, the erosion or resorption of the apices of permanent teeth, when related to apical infection, is pathologic.

It has been established that a healthy dental pulp, uninfected from dental caries, performs a very necessary function if the deciduous teeth are to be shed at the usual growth period of the child or animal. Delayed eruption of permanent teeth is frequently the evil result of infection of the pulp in deciduous teeth, a condition which is as often the fault of the parent as of the dentist.

In Figure 5, the resorptive action both of active peridental membrane and of dental pulp may be observed. On the mesial aspect of the mesial root especially, and to a lesser degree on the distal aspect, the irregularity in the cementum is marked. In fact, the dentin is exposed on the apical third of the root. When this tissue is compared histologically with that prepared from clinical material, the similarity is at once apparent in the uneven, eroded outline of the tooth root. This is true particularly in deciduous teeth with normal pulps; for, as can readily be shown, the pulp tissue produces erosion of the pulpal walls of the root canal such as is found on the periphery of the root. In the latter case, the peridental membrane is the actively functioning tissue, not the pulp.

An interesting fact hitherto unsuspected is the change occurring in the fibers of the dentin matrix during the period of active radicular resorption. When the cementum has been penetrated and the dentin exposed to the peridental membrane, it will be observed that the underlying dentinal fibers present a somewhat swollen appearance. In Figure 6, they seem to be closer together and somewhat larger than the fibers in an area where no active resorption is going on. It is suggested that the swelling of these fibers is a preliminary step to the subsequent complete degeneration of the tissue, thus accounting for the eventual loss of the whole root of the deciduous tooth. A comparison of the fibers in an unresorbed area is offered in Figure 7. It will be observed that although the magnification is somewhat greater ($\times 950$), the fibers are smaller and have fewer interlacing branches.

The next question to be considered is this: How does this process of normal resorption differ from the pathologic? As one approach to the solution of the problem, attempts were made to produce radicular resorption in laboratory animals. Two lines of investigation were used: first, a normal dental pulp was inoculated with a pure culture of a predetermined organism, and, secondly, mechanical stress was applied to the roots to such an extent that definite injury to the tissues of the root and adjacent structures resulted.

That undue pressure on tooth roots may produce pain of a neuralgic nature is a well-known clinical fact. For example, when an unerupted third molar was forced, during the process of development, against the distal aspect of the second molar, pain resembling trifacial neuralgia was described by the patient. Extraction of both teeth in question relieved the pain and an examination of the second molar revealed the cause of the trouble. The unerupted third molar had caused so much pressure resorption on the root of the second molar that the pulp was exposed.

It was not the object of the present experiment to produce trauma to this degree—quite the contrary. The point at issue seemed to be: Can radicular resorption be caused by placing tension or stress on the crowns of teeth? and in what re-

Fig. 9.—Area shown in Figure 8, higher magnification. The scalloped appearance of the dentin is characteristic of the process. (16 mm. obj., 8× ocular.)

Fig. 10.—Longitudinal section of buccal roots in maxillary permanent first molar. The crown was tipped mesially, thus producing pressure on the distal aspects of the roots, as here shown.

Fig. 11.—Deeply resorbed area rebuilt to a large extent by new tissue laid down from within outward. (Schmorl stain; ×250.)

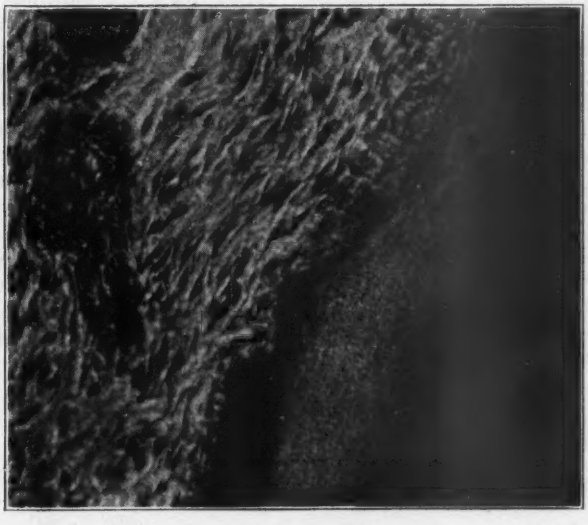

Fig. 12.—Longitudinal section from tooth on which new tissue is being formed. A small capillary is demonstrated. (Hematoxylin and eosin stain.)

spect does this experimental injury resemble or differ from that observed in the clinic? The first research gave unlooked-for results. The alveolar process between the two maxillary permanent central incisors was fractured. But in spite of this, or perhaps because of it, there was some slight evidence of loss of radicular tissue. This animal was on a full diet throughout the course of the experiment.

Let us compare next the changes in bone produced by infection. In Figure 8 is a typical histopathologic picture of a chronic apical abscess in which peradontium and dentin are involved. The necrosis of a large area between the mandibular permanent central incisors was the direct result of a blow sustained by the animal in the course of a fight with one of its cage mates. Some of the effects of this abscess are indicated more clearly in Figure 9. It will be observed that the scalloped appearance of dentin, cementum and bone, here illustrated, is quite similar to that found in the physiologic process of resorption on the deciduous roots. In the clinical cases which have been studied, there is this difference: In many instances, the bone and tooth structure which was destroyed during the period of greatest injury was later rebuilt. Apposition followed resorption.

This process has been observed also on some of the experimental cases. When the crown of a maxillary permanent first molar was tipped slightly mesially, the roots were partly resorbed on their distal aspects, as shown in Figure 10. Later during the experiment, the bands were removed and the tooth assumed gradually its normal position. In this interval of time, alveolar bone likewise was resorbed and rebuilt. In Figure 11, the result of this process is illustrated. The resorbed area extended as far as the innermost border in the dentin and probably would have gone farther if the pressure had been increased. Instead of that, the tooth was permitted to resume its normal position, and with the cessation of forced movement came a slow rebuilding process of both bone and tooth substance.

The mechanism by which this is accomplished is suggested by Figure 12. This section was stained by hematoxylin and eosin and is magnified a little more than 300 diameters. A small capillary in the vicinity of the area is demonstrated. Just as in the fundamental stage of normal bone development, there is a mesenchyme, so here, the presence of young blood cells, derived from the newly formed tissue, suggests that mesenchymal tissue is present and that consequently the rebuilding process is under way. Without the young blood vessels, no mesenchymal tissue would be present. But here, by the process of apposition, the irregular root outline is being rebuilt to one of regularity. Apposition has not always occurred, but at least as far as the experiment has gone, the gradual loss of hard substance, due to the various types of trauma, stopped when the injury subsided. Coincident with this has occurred a rebuilding process, which has resulted in the formation of new hard tissue.

FURTHER CONSIDERATION OF PREOPERATIVE AND POSTOPERATIVE CONDITIONS ASSOCIATED WITH EXTRACTION OF TEETH*

By BOYD S. GARDNER, D.D.S., EDWARD C. STAFNE, D.D.S., and BARKLEY S. WYCKOFF, D.D.S., Rochester, Minn.

A CONSIDERATION of remedies for the relief of pain following extraction of teeth has occupied much space in the literature of the dental profession since its inception, from the standpoint of both pain from the tooth itself and pain following extraction. Most of the remedies used for the relief of toothache before the time of Pasteur appear ridiculous today, as they varied from the fat of a frog, in the Middle Ages, to a cow-dung poultice, in the early part of the nineteenth century. If the patient ever gained relief, it was undoubtedly entirely psychologic.

Today, almost all dressings used in tooth sockets after the extraction of teeth contain an agent that is antiseptic and which has anesthetic qualities, together with a "carrier," such as gauze and oils. Many different preparations have been suggested by dentists and by pharmaceutic houses, all of which control pain more or less, especially in relation to so-called dry socket. If the technic of extracting teeth had kept pace with the ideas that have made general surgery a success, treatment following dental surgery would have been far simpler, and better standardized. Moreover, if asepsis had been carried out as in general surgery, and the general condition of the patient had been kept well in mind, the postoperative results would have been more nearly uniform. For example, in general surgery, the technic and the instruments used, and the operating room toilet, are such that the general surgeon can be more or less at home in operating rooms of other surgeons, particularly in approved hospitals. This condition does not exist with regard to extraction of teeth, even by those who limit their practice to this specialty. Some dentists do practically all of their work with forceps; others combine forceps and elevators, and still others employ burs, drills and chisels. These instruments are so varied in design and their application is so diversified that the student is at sea as to which is best. This variation often occurs in a dental college, resulting in further complications for the student. The undergraduate student receives little instruction and has a limited understanding of those conditions which should be considered from a preoperative standpoint. Postoperative training is minimized, and in some schools almost totally ignored. Hence, many recent graduates have little idea as to the probable prognosis in any case under their consideration.

*From the Section on Dental Surgery of the Mayo Clinic.

*Read before the Section on Oral Surgery and Exodontia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 22, 1930.

There are any number of preoperative considerations to be kept in mind. The presence of local infection, the possibility that the patient may be a bleeder, the operative risks in cases such as diabetes, hypertension and angina pectoris, the extent of surgical procedure advisable at one time, the choice of an anesthetic, the judgment as to when hospitalization of the patient is indicated and the proper medication before extraction are all to be considered. Extraction of teeth when acute gingivitis or stomatitis is present is justified only in case of extreme emergency. Erupting third molars are better left undisturbed until the acute infection has localized or subsided. Vastine,[1] Wolfe,[2] Krogh[3] and others have obtained gratifying postoperative results by resorting to preoperative treatment of the gingivae in cases of subacute and chronic infection around erupting third molars. Such treatment consists of general prophylaxis of the oral cavity and the application of various medicaments by means of a special applicator, selection of the medicament being determined by culture. This is in accordance with the method used by Keilty.[4] Such treatment should be instituted at least ten days prior to any contemplated operation. The manipulation necessary involves the danger of stirring up a latent or chronic infection, possibly with resulting exacerbation of local as well as general symptoms during the operative period. At the Mayo Clinic, oral prophylaxis was carried out in a selected group of cases prior to the administration of a general anesthetic for major operations, with the purpose of reducing pulmonary complications that might arise from aspiration of débris from an unhygienic mouth. It was found inadvisable to give such treatment unless it could be given at least ten days prior to operation. An arbitrary time of ten days has been fixed because any secondary manifestations resulting from a disturbance of an area of infection will usually develop within that time, and ample time is also given for antibodies to form and for the defensive mechanism to function.

Preoperative treatment of gingivitis is not applicable in all cases as a relatively large percentage of dental extractions may be termed emergency surgery, but its value should be recognized and it should be carried out as far as possible in those cases in which it is indicated.

As certain dentists employ general anesthesia to the exclusion of all forms of local anesthesia, and others seldom use a general anesthetic, there is every reason that the postoperative treatment should vary. For example, a dentist using a general anesthetic such as nitrous oxid-oxygen assumes that he has obtained a satisfactory result by certain postoperative treatment. This work may not stand postoperative examination as well as work that is carried out with perhaps a different anesthetic and technic. The majority of dentists do not make calls on their patients following operation, as is done in the practice of medicine, and accordingly postoperative data are more or less indefinite. In other words, the large percentage of postoperative data are based on the results obtained from patients who are able to return to the dental office for treatment. Therefore, patients who are not able to return may seek advice from a physician; therefore,

1. Vastine, A. B.: Differential Diagnosis of Gingivitis, with Treatment, Dent. Cosmos, 66:13-18 (Jan.) 1924.

2. Wolfe, A. S.: Personal communication to the authors.

3. Krogh, H. W.: Personal communication to the authors.

4. Keilty, R. A.: Infectious Factors in Gingivitis and Relation to Dentist, J. A. D. A., 17:1251-1258 (July) 1930.

the most unsatisfactory results are often not taken into consideration. But in institutions in which information as to the general condition of the patient to be operated on as well as definite postoperative data, is obtainable, information can be gathered which throws direct light on conditions attending the use of the anesthetic as well as on the technic of the operation and the advantages of carrying out asepsis. Unfortunately, the large percentage of operations in the mouth performed by dentists are what may be termed antiseptic; in other words, the operations are done as they were in the time of the Civil War. In those days, surgeons found it necessary to use dressings which contained antiseptic agents, while today, general surgery may be termed practically drugless, and dressings used after operation may merely be sterile pieces of gauze that are not disturbed for a week or ten days.

From the beginning of time, the use of heat and cold has been a therapeutic measure in the treatment of pain and disease, and as the use of these agents has been handed down through the generations, we have not arrived at more definite conclusions as to indications for their use than did our predecessors. Heat and cold are not two distinct natural forces but are relative strengths of the same principle. The term "cold" is used to designate something that abstracts heat from the body; "heat," something that communicates heat to the body.

Of the many forms in which heat and cold are employed as a remedy for pain and disease, necessarily only those forms which apply to the subject at hand will be considered.

Although a high degree of heat by means of hot irons and the cautery has been used for a long time to arrest hemorrhage, it is only recently that the hemostatic properties of a moderate degree of heat have been demonstrated. Whereas applications of cold water and ice were formerly used to arrest hemorrhage, hot water has been found to be more efficient. Hot applications to a bleeding surface at intervals will usually arrest the hemorrhage more quickly, and the action is sustained longer than by the use of cold in the same manner. Hot water expelled from a syringe into any cavity, provided there are no large vessels open, will usually control the flow of blood. The explanation for this phenomenon is that the protein substance of the blood coagulates at 120 F.

In the earliest stages of inflammation, the prompt abstraction of heat usually suffices to control and abort the inflammatory process. Inflammation of varied degree follows injury to tissue. To prevent inflammation and postoperative swelling, an ice pack is applied immediately after the extraction of teeth, the success of this procedure depending on its immediate use. Lowering the temperature of the part prevents extravasation of the elements of the blood and lymph, a process which tends to occur more readily in an area of higher temperatures.

The application of cold to incipient swellings of infectious source is to be recommended in preference to the use of heat. Such infections are not infrequently reduced and totally aborted; whereas, heat tends to exaggerate and extend the infection. From a strictly bacteriologic standpoint, the variance of temperature created by hot or cold applications is of little consequence in inhibiting the action or reproduction of bacteria.

If the swelling and infection have become more extensive, heat by means of hot compresses is undoubtedly the choice. This is done for the purpose of bringing about active hyperemia, and thereby in-

creasing the number of leukocytes, hastening the formation of a leukocytic membrane and localizing the infection. The degree to which this end is accomplished varies with the virulence of the organism, and the resistance of the host under any fixed standard of treatment. The greater the virulence of the organism, the less the action of the leukocytes. Since the factor of resistance is obscure in so many of the severer cases, early hospitalization, if possible, is the best and safest insurance against the more serious complications which may arise. Hospitalization insures more rigid adherence to the course of treatment required; elimination, rest, diet, etc., all of which are significant in the control of infection.

Actinotherapy has been employed for a long time in the treatment of pathologic conditions in the oral cavity. The foremost rays commonly used have been those of radium and the roentgen rays. More recently, there has been much written in dental literature on the use of the ultraviolet ray in the treatment of postoperative wounds, as well as its therapeutic value in the treatment of pathologic conditions. There is a widely divergent opinion among dentists as to the value of such measures, varying from the opinion of those who believe that it has no value whatsoever in the treatment, to those who claim that it is an indispensable part of dental practice. Among the latter group, there is again a great difference of opinion as to which type of lamp and length of ray is beneficial. Some dentists state that after several years of treatment of surgical cases with the water-cooled mercury lamp, they have concluded that the patients have not been appreciably benefited, but they affirm that results obtained from a Curay lamp are beneficial. Others assert that the Curay lamp has no value whatever, but that results obtained from the use of a carbon lamp are very gratifying. Still others declare that the two latter lamps are inefficient and they give preference to the water-cooled mercury lamp. Others assert that, in their opinion, none of these lamps have any definite value.

Such measures, especially when combined with other treatment, are rather difficult to evaluate. Visits made to a dentist at short intervals have a marked effect on home care, regardless of what the dentist may have said as to its importance. A patient undergoing a course of treatment for peridontoclasia will, during that time, give more and better attention to oral hygiene, a measure which in itself brings about decided improvement.

As for extraction wounds, claims are made which are unquestionably without foundation. It has been said that exposure of a socket to ultraviolet light immediately after the removal of a tooth not only assures a sterile blood clot but also insures against development of infection. This would be ideal, but unfortunately it does not occur. It is Sheard's[5] belief that ultraviolet irradiation as such cannot penetrate ordinary tissue more than a fraction of a millimeter. Although there may be a temporary effect on the surface, one cannot say that its application induces sterility throughout the blood clot. Any local benefit must therefore be limited to the inflammatory action which is induced. The penetration into tissue is limited as to depth. The ray is absorbed by the superficial blood, and it must be this general absorption of energy and its ability to affect the chemical constituents of the blood and of the tissues that give the

5. Sheard, Charles: Personal communication to the authors.

beneficial effects derived from ultraviolet irradiation. In view of this fact, it is logical to assume that the benefits in any given case would be greatly increased or even multiplied by giving the body general systemic irradiation.

Experiments on chickens demonstrate clearly that the absence of ultraviolet rays can be compensated by the use of cod-liver oil, which contains vitamin D, although there are other experiments which seem to indicate that the two are not exactly parallel. That the ultraviolet ray will prove beneficial in dental practice no one can say. At present, there is no definite evidence that such treatment alone can cure dental disorders. Considerable equipment is necessary to carry out the treatment and until the value of such treatment has been determined by well controlled experiments, one hesitates to advocate its general or universal use.

Much of the discomfort experienced during the extraction of teeth is caused by fear, which is more or less inherent. Surgeons in other specialties have long since recognized the value of preoperative medication to reduce the apprehension which a patient may have regarding operative procedures. This procedure not only insures better cooperation from the patient during operation but also adds a great deal to his comfort for several hours after operation.

Sodium *iso*amylethyl barbituric acid (sodium amytal) has been found especially suitable for dental patients regardless of the type of anesthetic used.[6] When the tendency to nausea and vomiting is reduced, one of the disagreeable features of a general anesthetic is to a great extent avoided. Apprehension and fear cause increased secretion of epinephrin. When an additional amount of epinephrin is injected with a local anesthetic solution, the total amount is further increased, the systemic effects sometimes observed resulting. Elimination of fear and apprehension undoubtedly increase the threshold of safety for the administration of epinephrin. The dose of sodium *iso*-amylethyl barbiturate indicated for dental patients is from 6 to 9 grains by mouth one hour prior to operation. There is no contraindication to the use of other drugs if one wishes to use them. This barbiturate guards against pain for at least ten hours and induces sleep. The tolerance for procain is increased markedly. It has been shown that it requires three times as much procain to produce convulsions in dogs to which this barbiturate has been administered.

Until dental surgery has been placed on its proper plane, preoperative and postoperative care will not receive the attention that they should. It is readily seen that the extraction of teeth and preoperative and postoperative care are far more important than the average dentist believes them to be, as undoubtedly 80 per cent of the revenue derived from dentistry is from the replacement of lost teeth. It is not the purpose of this paper to encourage undergraduates to become highly trained specialists in exodontia. Ample time and training should be given so that students will appreciate that the extraction of teeth should be well done, and if they are not able to do it well themselves, they should refer the work to one who can do it well.

6. Lundy, J. S.: Barbiturates as Anesthetics, Hypnotics and Antispasmodics; Their Use in More than 1,000 Surgical and Non-surgical Clinical Cases in Man and in Operation on Animals, Cur. Res. Anes. & Anal., 8:360-365 (Nov.-Dec.) 1929.

DISCUSSION

George Schneider, La Salle, Ill.: I should like to ask whether Dr. Gardner advocates

isolating the field of operation in extraction.

William L. Shearer, Omaha, Nebr.: Any anesthetic which we as professional men may choose to employ in the care of the sick is worthy of serious consideration. If I were to refer a patient for a certain professional service, and he were to ask what kind of anesthetic he would be given, I would say, "I don't know, I am sending you to a doctor in whom I have great confidence. Do as he tells you."

T. R. Scholz, Hemingford, Nebr.: I have recommended in all cases of extraction the aid of a complete diagnostic examination including roentgenograms, transillumination, and vitality tests as well as postoperative roentgenographic checkup. I have found a large number of retained foci of infection which led me to believe that such a complete diagnosis is clearly indicated, for I have had the pleasure of having many patients suffering from various diseases of organic nature definitely benefited by the eradication of the foci disclosed thereby. There is one thing that involves the profession at large in connection with diagnostic thoroughness and that is the need for more universal support of these measures unbiased by the economic phase that presents itself. Frequently, patients tell me that they cannot afford even a moderate fee for this service. (Incidentally, they often drive up later in better cars than I can buy.) I then take the alternative of including the service gratis, or referring the patient to another practitioner in the hope that his explanation of the needs of the case may be more convincing. I find that in the latter alternative, I am often confronted by the fact that the one to whom I have referred the case has given the patient to understand that I am a bit enthusiastic in recommending complete diagnostic service, and, as I am a younger man in the profession, this definitely hurts my standing in the community. Since Dr. Gardner and others have shown us so conclusively the need for this greater measure of care in diagnosis, may we cease to be biased by the fact that many patients consider it "extra," and may we have the courage to set an adequate fee and give the service. Thorough diagnosis is the keynote of modern medicine; why not of dentistry?

H. E. Straub, Los Angeles, Calif.: I have made some investigation of therapeutic lights and lamps. All that I have been able to find out about them coincides with what Dr. Gardner has told us—that they have relatively little value in our hands. The infrared lamp for inducing heat is fine, but I cannot feel that the ultraviolet in a dental office has yet reached a point where it has any particular value.

Dr. Gardner: Regarding walling off by gauze at the time of extraction, I assume that Dr. Schneider referred to the use of gauze packing. The important thing to consider is pulmonary damage by débris getting into the trachea at the time of extraction. This was brought out in the motion picture shown by Dr. Seybold. The same procedure should be used with both general and local anesthetics. We have seen many patients at Rochester with foreign bodies of dental origin such as pieces of the alveolar process, filling materials, crowns and even teeth themselves, in the bronchus. These foreign bodies were aspirated at the time of extraction, and it is obvious that the large percentage of these patients had the teeth extracted under general anesthesia. I do not believe that the field of operation can be sterilized without harming tissue. In making cultures of teeth at the time of extraction, we have to make use of some medicament to render the field of operation as nearly sterile as possible, and our best results are obtained when iodin and alcohol are used. Mercurochrome even to a strength of 12 per cent was not found so satisfactory as we had hoped that it would be. If the dentist who practices surgery of the mouth would emulate the work of the general surgeon, his results would be more satisfactory. The general surgeon, for example, does not attempt to sterilize the mucous lining of the stomach in stomach surgery, but, he does keep up the chain of asepsis and, with the exception of skin sterilization, his work is drugless. If pulp canal surgery ever proves to be a safe procedure, it will be because it is done along the lines that have made other surgery a success. Medicaments sealed in root canals tend to exhaust themselves and their disinfectant properties, and therefore we cannot expect canals to remain sterile. We should not overlook the possibility of periapical infection being caused by infection elsewhere in the body. In regard to referred patients: I appreciate that I am not handicapped as is the average specialist, since I have access to the complete history of every patient. The selection of anesthetic is my re-

sponsibility, as well as the decision as to the number of teeth to be taken out at one operation. We must all listen to the wishes of our patients in regard to the anesthetic; yet we should not let such desires interfere with our judgment. It is our responsibility and they have been referred to us for the best service that we can render. The specialist in extraction of teeth is often handicapped by suggestions from the dentist who referred the patient. He has passed the responsibility, yet he oftentimes suggests the anesthetic to be given and the technic to be used in the extraction of teeth. I believe there is a better understanding between the general practitioner and the specialist in this respect now as we are hearing less complaint than we have in past years. The surgical service that the dentist gives should always be the best regardless of the fee. But this thought cannot be carried out in the same degree in restorative work. Surgical fees should be based on the nature and difficulties of the case, and the financial condition of the patient, rather than on the number of teeth extracted. When more dentists appreciate that approximately 80 per cent of the revenue derived from dentistry is from the replacement of lost teeth, and not until then, the surgical aspect of dentistry will be placed on the high plane desired.

DENTIST'S RESPONSIBILITY IN THE PREVENTION OF MALOCCLUSION*

By WILLIAM R. HUMPHREY, D.D.S., Denver, Colo.

THE first reaction to such a title as the "Dentist's Responsibility in the Prevention of Malocclusion" is the question, "Can malocclusion be prevented?" It is not my idea to create a utopia wherein every child would have a perfect denture. Many cases of malocclusion are symptoms of some systemic trouble which would have to be adjusted before the malocclusion could be corrected. There are many cases which have local causes and are under the direct control of the dentist. It is of these that I wish to speak. Perhaps the largest percentage of successfully treated cases fall in this class.

The deformity, disharmony and lack of normal function in malocclusion is progressive. The longer a case is allowed to go untreated, the more extreme it becomes, and the more difficult to correct.

During the past twenty-five years, malocclusion of the teeth has been variously treated, and I do not believe it is a misstatement to say that in the last decade it has been dealt with successfully. Considering the comparatively short period of evolution through which the practice of orthodontics has passed, the uniformity of good results obtained at this time by the conscientious practitioner is remarkable. Compare these results to those secured when the expansion arch was first introduced. Results which would have created great enthusiasm then would perhaps not be considered successful at all at the present day.

There are many reasons for the improvement in methods of treatment. Of course, the improvement in mechanism has had much to do with the improvement in treatment, but undoubtedly the

*Read before the Section on Orthodontia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 24, 1930.

greatest single factor has been the closer study of underlying causes. A search for the causes and a careful diagnosis of existing conditions are common practice today. This advancement, instituted by the early teachers of the subject, fostered by the societies and practiced by successful practitioners, has very gradually, but just as surely, placed the treatment of malocclusion on the plane that it now occupies. Just as this closer study of cause and effect has brought about better and more nearly uniform methods of treatment by the specialist, so has the same information been active throughout the whole profession, as is evidenced by the fact that cases of malocclusion reach the specialist at an earlier age, which permits the interception of the maldevelopment and the guidance of growth into normal channels.

It would be beyond the fondest hope of any of us who are deeply interested in this subject to have any definite action instituted after the recital of a few of these elementary facts. As progress in the treatment of malocclusion has been accomplished, so will prevention of malocclusion follow, if we will but become "preventive-minded."

I have been able to gather a great deal of information from a textbook entitled, "Preventive Medicine and Hygiene" by Milton J. Rosenau, and I urge you to read it. This book of about 1,300 pages will give the reader a comprehensive review of what the medical profession has done to prevent disease, and will also apprise the reader of the vast amount of study and work accomplished by Dr. Rosenau during twenty-three years of various experience in public health work. To quote from the preface:

> **This book may be considered in two parts, namely, that which deals with the person (hygiene) and that which deals with the environment (sanitation). The first part includes the prevention of the communicable diseases, venereal prophylaxis, heredity, immunity, eugenics, and similar subjects. The second part deals with our environment in its relation to health and disease and includes a discussion of food, water, air, soil, disposal of wastes, vital statistics, diseases of occupation, industrial hygiene, school hygiene, disinfection, quarantine, isolation, and other topics of sanitary importance, as well as subjects of interest to health officers. All the important methods used in public health laboratories are described. . . .**
>
> **It has been my object to give in this volume the scientific basis upon which the prevention of disease and the maintenance of health must rest. Exact knowledge has taken the place of fads and fancies in hygiene and sanitation; the capable health officer now possesses facts concerning infections which permit their prevention and even their suppression in some instances. Many of these problems are complicated with economic and social difficulties, which are given due consideration, for preventive medicine has become a basic factor in sociology.**

Preventive dentistry is likewise becoming a basic factor in sociology, so much so that commercial institutions are advertising and broadcasting to the layman the prevention of dental disease. Malocclusion ranks a close second to caries as a predisposing cause of dental disease, and the dentist's responsibility in prevention, wherever possible, is great. It is commonly known that many of the etiologic factors in malocclusion can be controlled by the dentist, and another group can be controlled by the child and the parents under the guidance of the dentist, if he will but awaken to his responsibility and take advantage of his opportunities.

All of the preventive measures developed and put in practice by the medical profession have increased the average life expectancy and have materially cut down infant mortality. These measures of prevention have covered a wide range, including not only the control of communicable disease by vaccination, inoculation and sanitation, but also a reduction

in the incidence of many other diseases through a study of our food supply and habits. To mention all of the diseases so prevented would be impracticable. We are all familiar with the classic examples of smallpox, typhoid fever, dysentery, hookworm disease, yellow fever, diphtheria, scarlet fever and many others; some so well controlled as to have been practically obliterated. Since Jenner's discovery of vaccination as a preventive of smallpox, the disease has been checked to such an extent that many physicians practicing today have never seen a case. Also, through a vast amount of research and experimental work, many debilitating diseases, such as scurvy, rickets, xerophthalmia and pellagra, have been controlled to such a point that the admiration of all scientific minded men is aroused. The prevention of this group of diseases, made possible by the recent discovery of the vitamin content of food and allied and closely related physical agents, such as heliotherapy and the use of the ultraviolet ray, is more closely related to our problems than the first group mentioned. Very often, the teeth and their supporting tissues are among the first to suffer in these diseases.

In dentistry, we have a much smaller field to cope with, principally the prevention of caries, malocclusion and periodontoclasia. These are all interrelated, and all of the investigations being conducted by our research men, whether directed toward the prevention of one or another, will be beneficial in the prevention of all. Dentistry has a right to be proud of its research men. Howe, Gottlieb, Orban, Kronfeld, Marshall, Noyes, Hermann Becks and many others have contributed greatly to our fund of information and are constantly laboring toward the prevention of caries, malocclusion and periodontoclasia.

I shall not quote at length from the literature on diet, biochemistry, endocrines or any of the predisposing conditions. You are all more or less familiar with the progress being made in these fields. Much of the information available at this time is not practical for clirical use; and, further, not being a research man, I am not sufficiently informed to teach any method of prevention which is the product of the laboratory. We will all welcome the day when the alarming percentage of caries found in the mouths of school children can be controlled as some of the diseases mentioned have been.

The thing I am particularly interested in is that the child patient receive good service in operative dentistry, a method of prevention we as practitioners are all able to employ. Refer the patient to the pediatrician so that a correct diet, free from fads, shall be followed out. Oral prophylaxis for children is probably the next step which the dentist has available, and, if employed properly, it will do much to prevent caries and malocclusion.

In a paper read before the orthodontic section of the Chicago Midwinter Clinic, I urged that dentists pay more attention to dentistry for the child of preschool age. The difficulty of restoring deciduous teeth having large cavities without the loss of vitality of the pulp and subsequent premature loss of the tooth is a cause of a large percentage of cases of malocclusion. If we are to make the progress in the maintenance of the deciduous teeth that has been made in our efforts to save the first permanent molars, we must see children at least as early as at 3 years of age, so that initial decay of the deciduous teeth can be cared for and the deciduous dentition kept in normal function. This function, promoting normal jaw growth, does much to prevent maloc-

clusion. Regardless of the claims of some investigators, I have seen too many teeth drift and grow forward, impacting the permanent teeth, to be carried away with the high sounding theories that jaws will develop normally whether or not the deciduous teeth are maintained. It is the dentist's responsibility to see that his patients, the parents of these young children, are enlightened to the need for this early care; and if he does not or cannot care for these children, he should refer them to a children's dentist, and that at an early age, at least not later than the third year. These patients of preschool age should be given the same careful examination that an adult receives. They, more than anyone else, deserve a complete diagnosis, roentgenographic examination and study casts where indicated, and, if necessary, competent consultation. The internist, pediatrician, otolaryngologist or orthodontist should be permitted to see the case when in doubt, as such consultation will do much to prevent serious malocclusion, dysfunction and the attending deformities.

Habit has long been a recognized cause of malocclusion, and it is the dentist's responsibility to acquaint himself with the available information in regard to such habits as are factors in malocclusion. That a case of malocclusion results from thumb or finger sucking is easily recognized; however, no less an authority than Clinton Howard of Atlanta, Ga., has said, in a paper read before the American Society of Orthodontists in Nashville, that he has never seen a case of malocclusion so caused which would not correct itself if the habit were broken at an early age. Lip biting and tongue habits are factors in many extreme cases of malocclusion. These should be detected and the parent advised of their seriousness. Pressure on the external surface of the face will likewise cause asymmetrical development and malocclusion. Harvey Stallard has, up to this time, examined 7,000 children, 1,500 of whom were of preschool age. His investigations have been carefully and scientifically conducted. His writings should be studied with the same care by the preventive-minded dentist. Such reports cannot be thrown aside to gather dust if we are to make the progress during the next twenty-five years that we have in the past. Abnormal atmospheric pressure, another factor in malocclusion, can be controlled, and there should be no abatement in our search for enlarged and infected tonsils and adenoids in young children. Closer cooperation between the dentist and the physician in this and many other ways will prevent malocclusion.

Treatment of malocclusion of the deciduous teeth is not necessarily a preventive measure. It is preventive only when the deciduous teeth are not in normal function. Mesial and distal occlusion, so-called crossbite and lingual bite of the maxillary teeth, all should be treated before the eruption of the permanent teeth so that the masticating efficiency of the deciduous teeth may be kept at its maximum. If deciduous teeth have been lost prematurely, simple space retainers should be placed. The presence of impacted or supernumerary teeth, or the congenital absence of permanent teeth, will also be discovered in time to be cared for and contribute to the prevention of malocclusion if the children are carefully and systematically examined, and given the same careful attention in diagnosis that adult patients receive.

We as practicing dentists must always keep abreast of the times and use such of these discoveries in the fields of medicine and the allied sciences as are applicable

to our daily practice. And we must not regard the work of any research man indifferently. The large percentage of children attending our public schools who have malocclusion of the teeth makes it imperative that the dentist employ the preventive measures outlined, as they are probably the best procedures that we now have available to assist in controlling this condition.

1232 Republic Building.

DISCUSSION

Homer M. Shelden, Kansas City, Mo.: We are living in an age of prevention, and the general practitioner, as well as the orthodontist, should recognize the cases of malocclusion early in the child's life. We are told that from 70 to 75 per cent of the children of this country have some form of malocclusion, and, as orthodontists, realize that these cases are difficult to treat later in life, but when found during the formative years of the child, they are much more susceptible to treatment. The general practitioner is the man who generally sees the child first, and on his shoulders rests a responsibility in the prevention of malocclusion.

Charles H. Walrath, Portland, Ore.: I have heard a great deal about what the general practitioner should know, and the preventive measures he should take in orthodontia; but it seems to me that the burden of teaching these practitioners to tell the patient or the parents of the patient about preventing these cases in their incipiency should lie with the school. Every school should have in its course enough courses in orthodontia that it would stand on an equality with the other major subjects, and I think this is coming. We need more papers on this subject. I have a great many patients who have been wrongly instructed. The day I left the office, a woman brought two boys to me. The older had what is commonly called a Class 1 case, a badly crowded condition. The younger had a lip habit, and he was forming a pernicious Class 2 case. The dentist sent the older boy to me but stated that the younger boy's case was not bad and would correct itself, but he did not tell the parents why the case was developing into a Class 2. He did not understand that the tongue habit would eventually cause more deformity in the second boy than the Class 1 case would cause in the older boy. The mother asked me to call up her dentist and to tell him what I had told her, which was done. He took it very nicely, but many would not.

Abram Hoffman, Chicago, Ill.: The responsibility for the conditions mentioned is in a large measure that of the dental school. The lack of information along these lines in the dental profession is probably at fault, but again, the lack of this information may be placed directly on the dental school. Still, schools have a word to be said in their behalf. I have been teaching for many years and have been a practitioner in orthodontia for many years, and while there is a great deal of censure which may be said to be justified here, there or elsewhere, it should be remembered that the field of orthodontia is new. The older men in the practice and teaching of the subject have desired to arrive at many truths, but, for one reason or another, we have had to bide our time and await returns. The dental schools, until very recently, have not realized the importance of appointing full-time teachers and investigators in this field but, happily, there are now several schools undertaking orthodontic research, and elaboration of the curriculum to make orthodontia a major subject. Within the last few years, there has been a definite change in the attitude of the universities toward our specialty. There are several of the leading universities that have undertaken to inform the general practitioner in the field of orthodontia. This is a good sign. A great deal of criticism has been directed at the orthodontists because of their ideas for presenting orthodontia to the general practitioner, and I have seen the time when there would be but a mere handful of listeners in a section meeting; but conditions are changing, and the dentist better understands that he must have the fundamentals first—that he must have the "why" first and then the "how."

Dr. Humphrey: It would be a good idea to put in the curriculum of all dental schools courses in preventive dentistry. That would cover many things that we are discussing here. One point brought out should be emphasized: we do not have to depend on a discovery in biochemistry, or anything of that sort, because there are so many possible pro-

cedures, right at hand, such as moving something aside or a little observation as to what has caused the existing conditions. That will do more good than all the appliances that can be put on later. It has been mentioned that the general practitioner of dentistry sees the child first. That is true, but the physician probably sees the child before the dentist does, so it would be well if we could get more information to the medical men. There has been, as has been mentioned, an attitude of indifference toward child dentistry, but that is becoming less and less true. The future is very hopeful.

APPLICATION AND USE OF THE NEWEST ANGLE ORTHODONTIC MECHANISM*

By HOMER M. SHELDEN, D.D.S., Kansas City, Mo.

THE edgewise arch appliance was first presented to the Angle Society of Orthodontia in Pasadena, Calif., by Edward H. Angle in 1926, and it was later presented in New London, Conn., in June, 1928. In the orthodontia section at the Midwinter Clinic of the Chicago Dental Society in 1929, Allan G. Brodie gave a paper on this appliance. Both of these articles, which have appeared in print, covered the subject thoroughly; therefore, whatever I may say will necessarily be somewhat of a repetition of their work.

Fig. 1.—Bracket band.

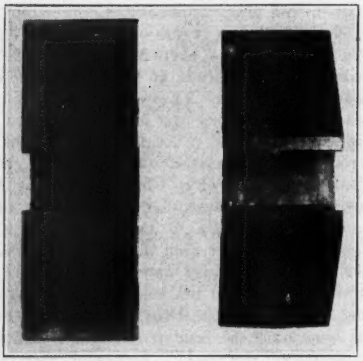

Fig. 2.—Front view. Left: Tie bracket. Right: Alinement bracket.

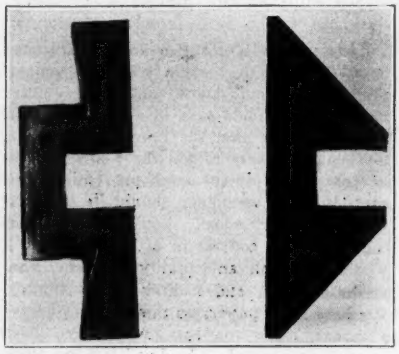

Fig. 3.—Side view. Left: Tie bracket. Right: Alinement bracket.

The application and use of the edgewise arch can best be appreciated and understood after a careful description of the

*Read before the Section on Orthodontia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 22, 1930.

mechanism. The accompanying illustrations will afford a clear and concise outline of its mechanical principles and uses.

Figure 1 shows a band 1¾ inches long, one-eighth inch wide and 0.004 inch thick with a bracket soldered in the center. On the left in Figure 2 is shown a front

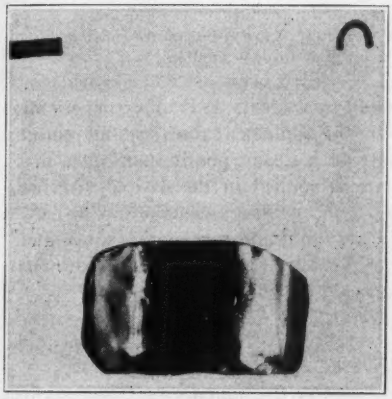

Fig. 4.—Above: Left: Rectangular tube. Right: Staple. Below: Molar band with rectangular tube soldered in position.

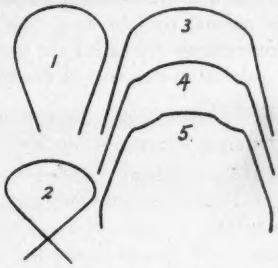

Fig. 5.—Steps in bending arch.

view of the tie bracket, enlarged to show in the center the slot for the arch. On the right is the alinement bracket, the outer ends of which are beveled from the slot to the edges of the band. When the alinement bracket is used, an auxiliary attachment, called a staple, is soldered to the band at one side of the bracket, to aid in rotation or to hold the arch secure. In Figure 3 (left), the flanges are shown on the tie bracket to carry the wire ligature; also, the slot for the reception of the arch is more plainly shown, and the alinement bracket on the right.

The tiny rectangular tube shown in Figure 4 on the left is one-eighth inch in

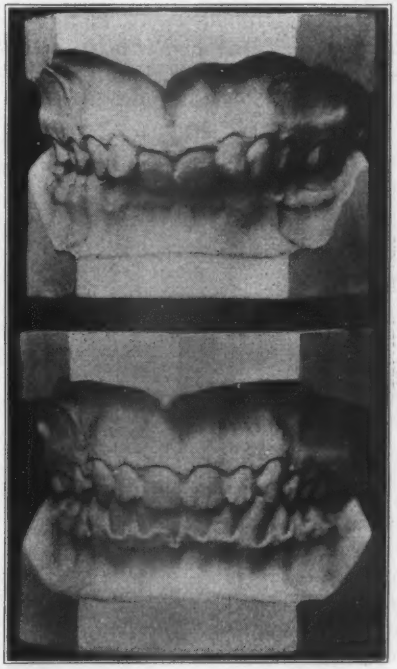

Fig. 6.—Case corrected by second order of movement.

length and is soldered to the molar clamp band to carry the arch as in Figure 4 (below). The staple shown on the right above has a bore of 0.015 inch.

The arch is made of gold platinum material and measures 0.022 by 0.028. It is supplied in foot lengths and is cut to the

desired length. The arch is used just the opposite from the ribbon arch, that is, the wider side (0.028) fitting flat, or edgewise, into the bracket.

The bending of the arch will be briefly described here, as it will be shown in detail in the moving pictures which will follow and also in the clinic.[1] Heretofore, no definite plan has been followed in the formation of an arch, but now an ideal arch is formed to accord with the measurements of the widths of the six anterior teeth, and a study made of the size of the teeth and the type of face and skull. Figure 5 shows the arch in various

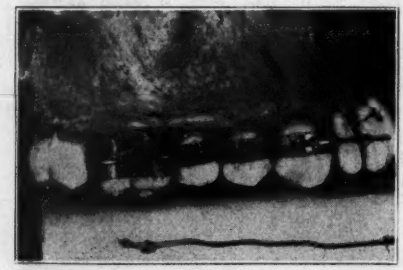

Fig. 7.—Small vertical bends in arch to carry buccal teeth distally.

forms of bending. When formed, the arch is ideal, Dr. Angle says,[2] "for it is only in the proper shaping of the arch that 'all the honor lies' for effectually awakening the magic power within it to do our bidding in tooth movement." Much patience and practice is required to master the technic of arch bending, but when it is mastered and applied as nearly as possible to the ideal form, the outcome will surprise the operator.

1. See Dr. Angle's article, page 1154 Dental Cosmos, December, 1928, for detail description of arch bending.

2. Angle, E. H.: Dent. Cosmos, 70:1150 (Dec.) 1928.

Dr. Brodie, in discussing force, says[3]:

With most appliances, from the "E" arch and ligatures down, our force control has been so imperfect and our leakage of power so great that more force was expended by far than is necessary with a modern appliance. We have felt, naturally, that all this force which we were applying was acting on the tissues, and we gradually became accustomed to a slow response. We now know that this was wrong, and that speed depends not on the amount of force, but on the efficiency with which that force is applied.

Much has been said and written about rapid movement. It is an erroneous idea that this appliance causes such movement; instead, a steady, gentle, continuous pressure is applied in the desired direction, carrying out the various orders of movements simultaneously, with a much more rapid result. The movement is continuous rather than rapid.

We have two distinct types of tooth movement with distinctly different bends for their attainment: (1) the correct shaping of the dental arches, placing the crowns of the individual teeth in their correct relations in the arches; (2) the tipping distally of single teeth or groups of teeth that require such movements, into their normal upright axial positions. These movements are called the first and second order of movement. A description of each follows.

FIRST ORDER OF TOOTH MOVEMENT

With the arch ideally formed, lingual, labial or buccal movements, elevation, depression and rotation movements may be accomplished. In some cases, the round 0.022 arch is used to bring the crowns into alinement, later being replaced with the baby arch (0.022 by 0.028) for root development. In extreme cases of malocclusion, when the teeth are much out of alinement, the arch may be altered from

3. Brodie, A. G.: New Angle Mechanism, J. A. D. A., 16:2085 (Nov.) 1929.

Fig. 8.—Class 1 case treated by first order of movement.

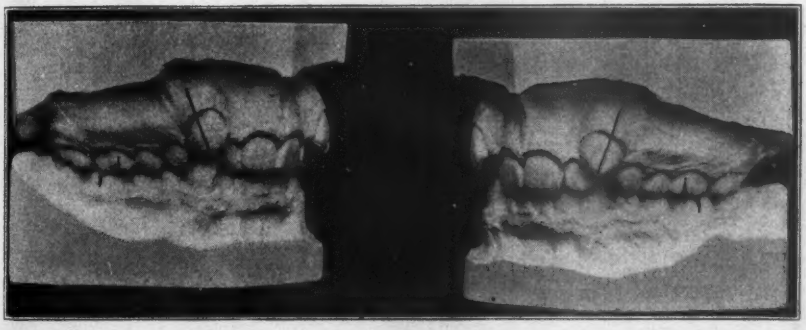

Fig. 9.—Case before treatment; showing forward tipping of cuspids.

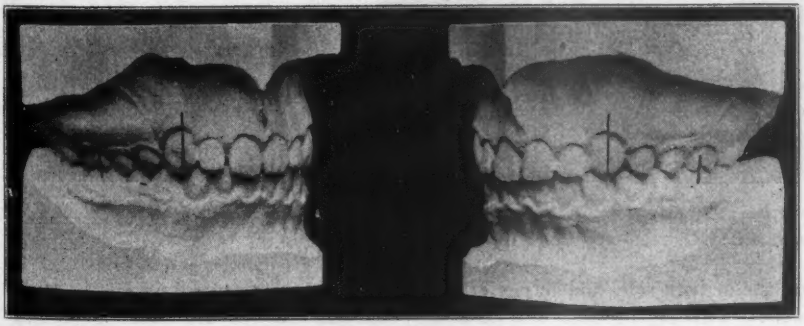

Fig. 10.—Case shown in Figure 9, after treatment; molars, bicuspids, and cuspids in upper arch carried distally by second order of movement. The position of the cuspids is upright.

its ideal form temporarily, but later, after the teeth are nearer alinement, the ideal form should be resumed.

SECOND ORDER OF TOOTH MOVEMENT

The second movement is the tipping backward of all the teeth simultaneously on one or both sides and in one or both arches. This tipping force in a distal direction on the crowns of the teeth, with little if any mesial movement of their roots, accomplishes one of the most desired movements today, bringing the teeth upright into their correct axial relations. By adjustment of the arch to bind, when seated in the slot of the bracket, pressure is exerted in a distal direction. Two very small vertical bends are made in opposite directions, one upward anteriorly to the bracket, and one downward posteriorly to the bracket. When seated in the bracket, the arch will pry downward on the

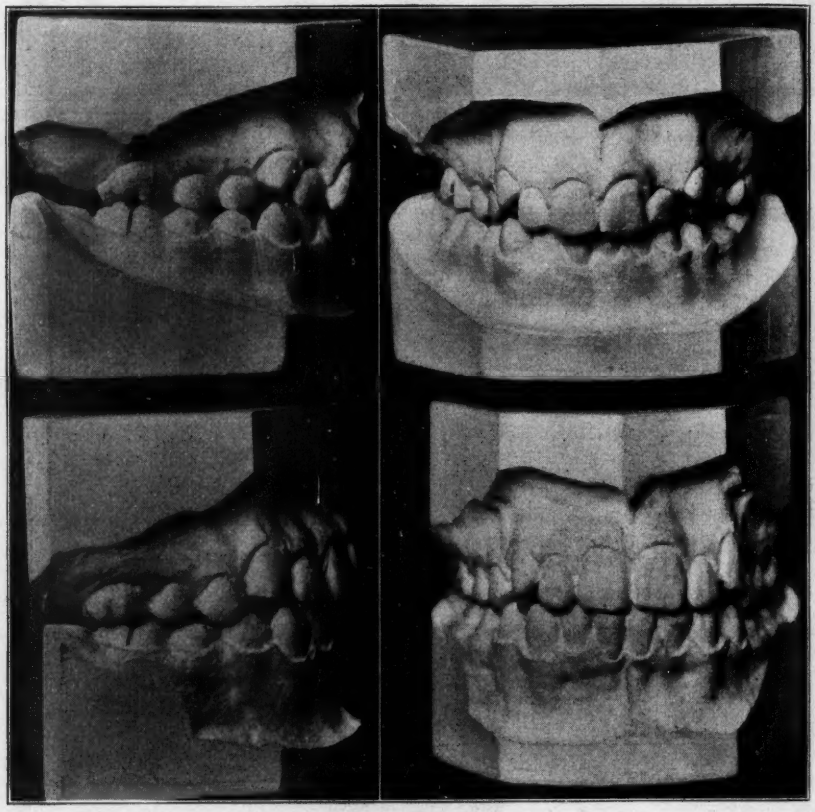

Fig. 11.—Side and front views of case at start and three months later, when retainers were set.

front and upward on the distal end of the bracket, the result being a distal movement.

In Class 2 cases, we often find that the upper molars have moved forward bodily with the bicuspids and often the cuspids. The lower molars are tipped forward, and there is an exceptionally marked and disfiguring overbite. Because of the faulty muscle pull, the jaws cannot develop normally. With proper treatment, using this second order of movement, the lower molars can be tipped up into correct positions and the upper molars retruded, proper function of the jaws being thus restored and in turn, normal development of the entire dental mill assured. Figure 6 illustrates this change in a case. Figure 7 shows the small vertical bends in the arch to carry buccal teeth distally.

In so many so-called finished cases today, we see children with prominently protruding mouths. These cases are often found to be bimaxillary protrusion cases, and unless treated as such, the outcome is anything but beneficial. With the same tipping force in both arches, all buccal teeth are carried distally.

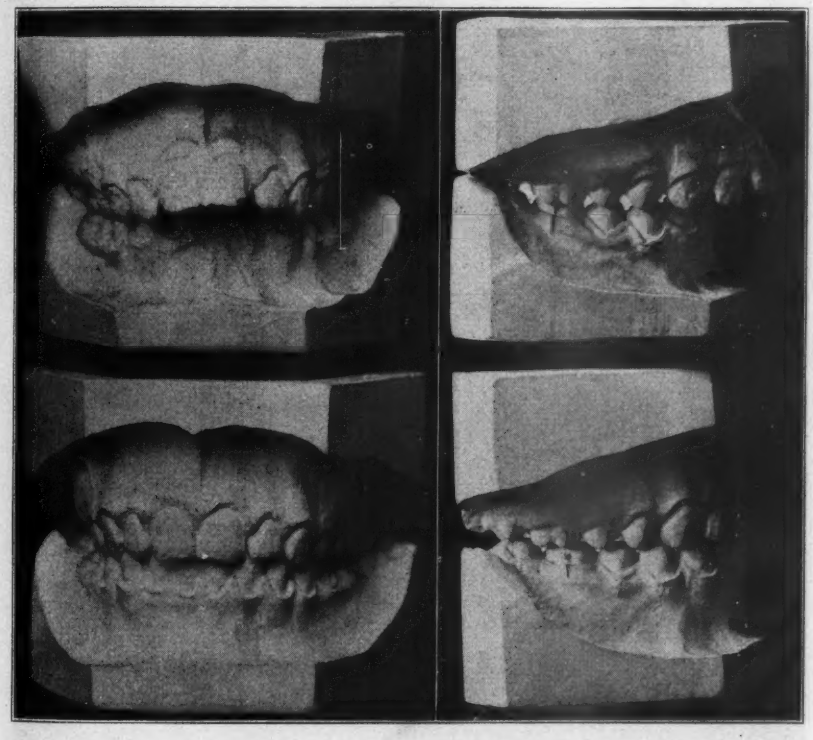

Fig. 12.—Front and side views of case at start and seven months later, when retainers were set.

THIRD ORDER OF TOOTH MOVEMENT

The third order of movement is a torque power in the arch which will move either the crowns of the teeth or the roots, lingually, labially or buccally. To accomplish this movement, two slight twists in the arch are made, one anterior and the other posterior to the bracket which is to receive the arch. These are called torque bends.

This power is very beneficial when molars and bicuspids are locked lingually (Fig. 19). The torque power is added to the lateral spring of the arch, and acts directly on the crowns of the teeth, carrying them buccally. After this is accomplished, the torque power is reversed, to carry the roots buccally.

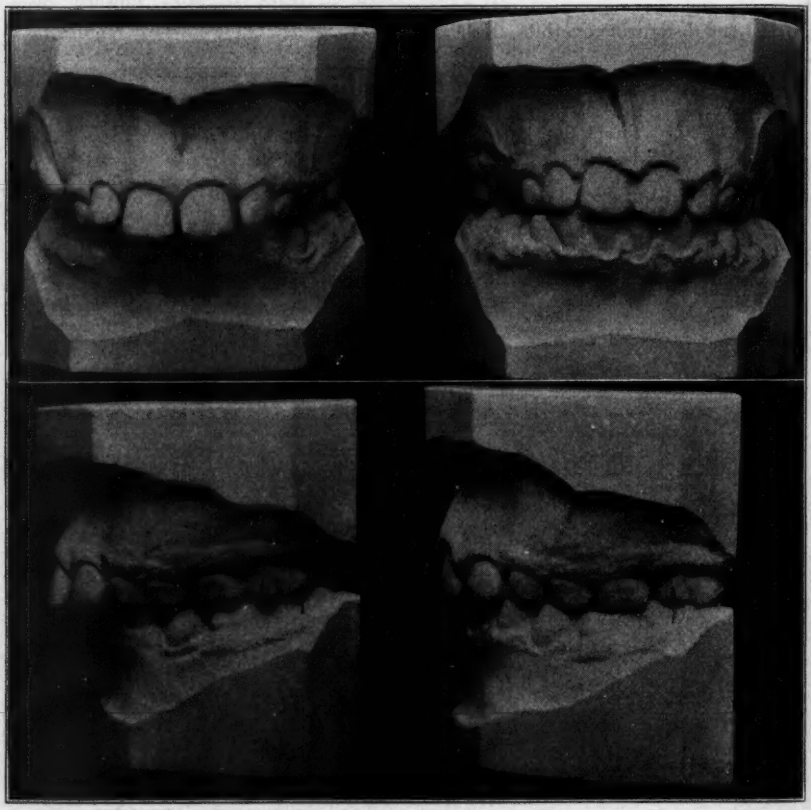

Fig. 13.—Front and side views taken at start of case and seven weeks later.

CASES SHOWING VARIOUS MOVEMENTS

The first order of movement can be used on such cases as the one shown in Figure 8. This is a Class 1 case requiring a little expansion and rotation, and can be corrected nicely by the use of the 0.022

round arch, bringing the crowns into alinement, and then replacing the round arch with the baby ribbon arch, which will move the roots into their proper axial relations.

Figure 9 shows a condition very commonly found in every orthodontist's office. The molars and bicuspids have drifted forward so that there is no room for the cuspids. The treatment required is the second order of movement; that is, the tipping back of all the buccal teeth, and the alinement of the anterior teeth. Figure 10 shows the corrected case. The axial relation of the cuspids are to be compared.

The side and front views shown in Figure 11 are of an 11-year-old boy, the views at the top taken at the start of case and the two lower views three months later, when the retainers were set. Treatment in the upper arch consisted of band-

Fig. 14.—Case shown in Figure 13, two years after all retention had been removed.

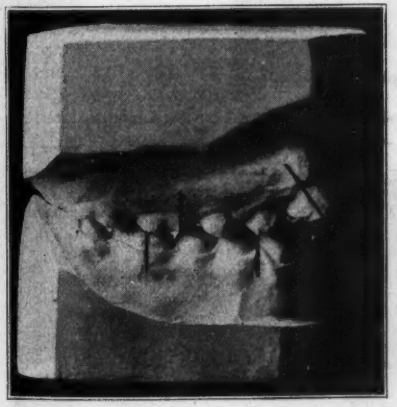

Fig. 15.—Class 2 case in a youth aged 16, showing forward tipping of cuspid.

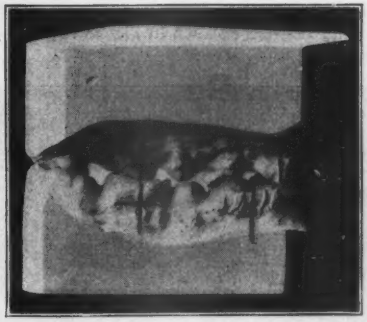

Fig. 16.—Study model of case shown in Figure 15, taken three months later.

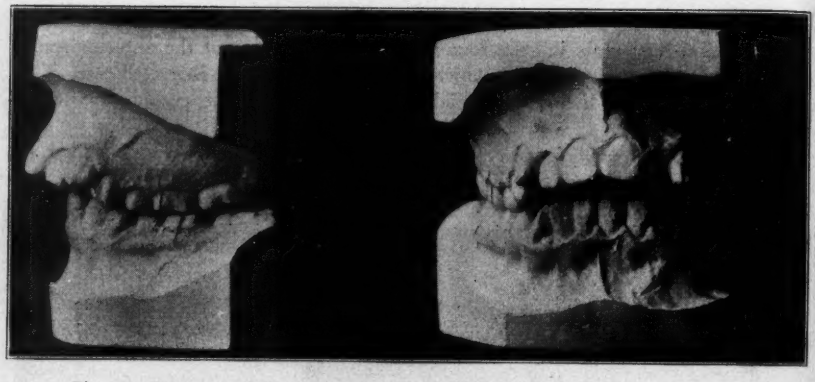

Fig. 17.—Forward drifting of teeth combined with a pernicious tongue habit.

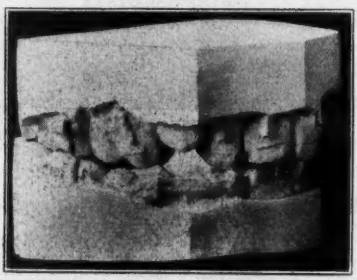

Fig. 18.—Case shown in Figure 16; study model taken two and one-third months later.

Fig. 19.—Left: Case with narrow upper arch. Right: Study model of case six months later. (Third order of movement used.)

ing both first molars with clamp bands, on which were soldered a small rectangular tube. The two lateral incisors and the four bicuspids were banded with tie brackets and the central incisors with alinement brackets. The arch was formed ideally for the case, with vertical bends for the bicuspids and molars to carry them distally. In the lower arch, practically the same teeth were banded except the second bicuspids, which were ligated to the arch. A more detailed description of the appliance can be found in Dr. Brodie's article.[3]

The front and side views shown in Figure 12 were taken at the start of the case and seven months later, when the retainers were set. The age of the patient was 11 years.

The righting of the upper and lower molars as well as the distal movement of the upper and the retrusion of the upper anterior teeth is shown in Figure 13. Pictures at the left were taken at the start of the case, and those at the right when retention was placed, seven weeks later.

The overbite condition was corrected by righting the molars, as is shown by the space between the deciduous molars.

Figure 14 shows the case in Figure 13, two years after all retention had been removed.

In Figure 15, there has been a forward drifting of all the buccal teeth. Note the inclination of the cuspid. The same case is shown in Figure 16, a study model taken three months later. The second order of movement has been carried out, that is, the distal tipping of all the buccal teeth. This patient was 16 years of age.

The case shown in Figure 17 is that of a girl aged 11 years. The open-bite manifest in the picture is the result of thumb-sucking followed by a pernicious tongue habit. The correct treatment calls for the carrying back of all the maxillary teeth, together with the closing of the open-bite and the alinement of the anterior teeth. The case is under treatment at the present time, and Figure 18 shows a study model taken after two and one-third months of treatment. The open-bite condition is practically corrected.

In the last case (Fig. 19) in the left picture is shown a very narrow upper arch with the molars and bicuspids in lingual occlusion with the lower. The third order of movement is here used, consisting of torque power together with expansion in the upper arch and the tipping back of the molars and bicuspids. All this movement is carried on at the same time. On the right (Fig. 9) is a study model taken after six months' treatment.

1624 Professional Building.

DISCUSSION

E. E. Greenwell, Ogden, Utah: Were the slides shown Angle slides?

Dr. Shelden: The slides shown were from my own practice.

E. E. Greenwell, Ogden, Utah: Would it be in order to ask Dr. Ketcham how the new Angle method is weathering the criticism of the mature critics?

A. H. Ketcham, Denver, Colo.: I cannot answer for others. The only criticism that I would offer would be the overenthusiasm on the part of Dr. Angle to show results in treatment immediately following the active operative treatment, especially in those cases in which the permanent teeth are in the process of erupting. I think he is overly enthusiastic in showing cases before the success of the treatment is assured.

Blaine Truesdell, Omaha, Nebr.: It is my belief that Dr. Angle was not striving for speed, primarily, but rather for results in corrective cases, and that the time elapsed is of secondary consideration. If causes of malocclusion are removed, there is no danger of relapse, in one week, one month, one year or one hundred years. That applies anywhere in the world under any conditions.

Dr. Ketcham: Dr. Truesdell is speaking purely from the diagnostic standpoint. The

causes of malocclusion are multiple. They reach from the grandfather down through succeeding generations, and you cannot remove the causes immediately and wave the magic wand of appliances. I do not mean to infer that Dr. Angle's object was to treat these rapidly, but he wanted to get results as rapidly as compatible. The results, in many instances, which have been shown were not finished results, and that was not explained in the text of the presentation. These cases must be watched, and there are many things that we must discover in the case, and some which we do not discover in many cases. Therefore, it is a much bigger problem than one of mechanics.

Hugh G. Tanzey, Kansas City, Mo.: The technic must be rather exacting in order to get desired results, regardless of the time required or the type of case. Referring to the general practitioner, if you are unable to control this particular appliance because of its complexity, you can design appliances for the individual case that will do the work and then devote the rest of your life to an effort to maintain the results obtained. Dr. Shelden is not doing very differently, nor would Dr. Angle if he were practicing today. In my opinion few are qualified to handle this appliance, and no doubt Dr. Shelden will concur in this. I have had considerable experience with the original adjustable band and labial arches and with practically all of Angle's appliances, and would say this last one is very difficult to control. I do not like so many bands on the teeth. However, the experienced will be amply qualified to choose between efficiency and appearance. I think that the amateur would be liable to do much damage in using this appliance.

Dr. Shelden: To answer Dr. Tanzey: To master any type of appliance, an orthodontist must spend considerable time in his laboratory perfecting the technic, before using it in the case. A physician or surgeon will spend from five to eight years in study, and then three years as an intern, and several years as an assistant surgeon before reaching his goal. Surely, the orthodontist, if he is successful, should spend sufficient time to master the technique, when working on such a delicate mechanism as a child's denture, and will not be considered an amateur in any sense of the word.

A. H. Ketcham, Denver, Colo.: I must take issue with Dr. Shelden in regard to his statement that absorption of the root ends of vital permanent teeth occurs less frequently where the Angle ribbon bracket appliances are used than where other types of appliances are used. A radiodontic survey[1] which I made of 500 treated orthodontic cases from the practice of Dr. Humphrey and myself shows that among the cases where the ribbon bracket appliances were used, root end absorption of permanent teeth occurred in a percentage of cases over three times as great as when the round labial arch wire was used. I doubt that root absorption can be rightly attributed to "jiggling," as Dr. Angle has termed it. A round arch wire attached to the anterior teeth either by ligatures or through resting in hooks attached to bands on the teeth which are being moved permits more nearly normal movement, or exercise, of the teeth in masticating food. Several orthodontists in this country and some in Europe who have made radiodontic surveys of their treated cases have found root absorption occurring more frequently in cases treated with the ribbon bracket appliance than in those in which either the round labial arch wire or the lingual appliance has been used.

Dr. Shelden: One of the greatest necessities in tooth movement is proper anchorage, and this is accomplished by placing bracket bands on all the teeth requiring movement. The largest percentage of cases that I have seen where root absorption has taken place are those in which the arch spans from the molars to the central incisors and, through the stress of mastication, the arch is allowed to move, a jiggling movement resulting. This cannot be blamed on an appliance, but on faulty application of the appliance.

1. Ketcham, A. H.: Internat. J. Orthodontia, 15:310 (April) 1929.

CHILDREN'S DENTISTRY AS AN AID IN PREVENTIVE PERIODONTIA*

By WALTER T. McFALL, D.D.S., Macon, Ga.

IN several hundred years from now, when history has recorded in its interesting pages something of our times, I hope and believe that it will be written large and transmitted to those who shall follow afar off that ours was an age of service, of interest in helping the individual to be and continue to be his best self in body, mind and soul—that those who lived in our profession in this century were far more concerned with assuring the best possible advantages for humanity than with the getting of material things.

Every field in medical science and the healing arts is earnestly striving to eliminate or prevent the maladies and other conditions which are daily taking their toll of lives, and which, in many instances, are most easily preventable, if the knowledge were disseminated properly as to methods of prevention and the desire to have and maintain good health were as strong an urge as is our quest for so-called freedom, pleasure and fame. There is no field in dentistry which should and must concern itself with the whole of dentistry and with the attempt to work for the elimination of our profession's need and usefulness in the honest and meticulous administration of health as must periodontia.

No successful periodontist should attempt to serve his clientele without first considering all the etiologic factors in the present condition which caused this patient to present himself for treatment to a man whom society expects and rightfully demands shall and must know more concerning the causes of periodontoclasia. There is no disease in the field of dentistry which affects quite so many adults as does the condition and its resultant ills which you daily treat. Surely, there is no specialty which has so many theories, and concerns itself with so many discussed etiologic conditions as does periodontia.

Certainly every section of the American Dental Association should have several papers on children's dentistry because children's dentistry is the responsibility and inherent personal obligation of each and every man in the dental profession. In the mouth and tissue conditions of every child before and after birth is the answer to many of the perplexing problems confronting dentistry today. When the child and the parent have been taught that a clean, useful, healthy mouth is as necessary to health, happiness and usefulness as is any other part of the body, and that just in proportion as the gateway to the body is preserved, cared for and utilized will the child have a fair chance of succeeding and becoming a self-respecting and useful citizen, the realization that we are

*Read before the Section on Periodontia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 23, 1930.

not coping with the problems and responsibilities which are ours will be eliminated.

More of the conditions affecting the gums, teeth and finally the health have had their inception in the mouth in childhood than come from any other one source our present mode of living seems to have made possible. In the compilation of this paper, I have sought the basis for your specialty; I have studied your theories—those regarding unhygienic or filthy mouths, bacteria and malfunction, insufficient circulation, malposition of teeth, faulty and unethical dental restorations, and lastly diet and trauma. I believe that with proper prenatal and preschool care, attention and direction, the large majority of children may be brought to adolescence and adulthood without ever knowing what toothache is or without being forced to undergo the ravages and too often disappointing results of the continuous treatment and care necessary to arrest and cure periodontoclasia. I shall welcome the day when members of our profession cease to practice empiric dentistry, when each and every case will be studied individually, when the mouth and its component parts will be studied and considered as an integral and important part of the human body, and when dentists begin to realize and measure up to the responsibilities and obligations incumbent on them as professional men, giving the greatest hope of our race, children, the proper care and attention, and the opportunity which should rightfully be theirs in life.

May I recall to your minds the subject of this paper—"preventive periodontia," or the part that children's dentistry can and should play in preventing the conditions that you are constantly called on to treat, arrest, relieve and cure. For more than seven years, I have given my full time to children's dentistry, but I have also during this same period served more than a thousand adults in clinics and hospitals, and therefore I feel I can tell you what I have seen rather than what I have heard or read from a book.

Too long the profession of dentistry has refused or failed to work for children, until today there is considerable doubt and confusion in the minds of the laity concerning the efficacy and need of this so much preached about dental service for children. The rank and file of the dental profession who daily refuse to serve children adequately, who do half-hearted, indifferent or mediocre work, or, worse, who continue to lie to children and parents about dental conditions of children, are doing more to cause this aforementioned doubt and confusion than any other one person or organization. If the dentist is not himself convinced of the importance of prevention, how can we expect those who look to us for guidance and direction to become interested? If the hope of preventing those conditions of abscessed teeth, inflamed and diseased gums does not have its beginning in helping children, pray where does it begin? The man in our profession who refuses to serve the child, who fails to handle the child patient properly, who makes of the parent and the child a frightened procrastinator and a dread victim instead of an appreciative and enthusiastic booster for mouth health, is a laborer not worthy of his hire, and the weak link in our ever growing strong chain of service to mankind and those we aspire to be of benefit and help to. A few men have told me they would like to go into children's dentistry because it is easy work, an easy way of making good money, and yet I am sure all these men come to realize at the end of the day that the proper

conduct of children's dentistry demands a man's best in diagnosis, operative skill, child psychology, sympathetic understanding and tolerance, love of service and the highest and finest in ethics and economics.

The work of children's dentistry which will prevent periodontoclasia in later life is this: Every parent or prospective parent should be taught to appreciate and to maintain health. All girls from high school age on should know that deciduous teeth are born and do not grow; that these teeth of child life begin their formation seven months before birth; that what a woman consumes in her diet during pregnancy makes for good teeth in her baby; that if the essentials are not furnished in the diet of the mother, Nature takes these ingredients in part from the bones and teeth of the mother. Girls should know that the prospective mother alone is responsible for the deciduous teeth, and that these twenty teeth together with the four first permanent molars are largely formed at birth. May we eternally teach that "cow's milk was meant to make beef out of calves and not human beings out of babies"; that for the first nine months of life, there can be no substitute for breast feeding as this develops and aids the formation of the teeth and jaws in child life. The diet of every growing child should be carefully directed. The child should be given what he needs and not what he wants. The first, the most important, visit of the child to the dental office should be at from 2½ to 3 years of age, and earlier than this, if he does not have a normal set of teeth or there appears a predisposition to early caries or malformation, hypoplasia or persistent inflammation of the tissues. According to the needs for each case, the child should be returned to the dental office for prophylactic treatment, examination and a checking-up of habits, diet, etc., as often as the dentist responsible feels is necessary.

Early detrimental habits of children, such as thumb, finger or fist sucking, bad sleeping positions in bed, the malicious practice of sucking pacifiers and other sure mouth deformers should most positively be corrected. A prophylactic treatment with proper home instruction to a child is the greatest operation any dentist ever did. Let us remember that it is the lesson taught and learned that counts, not the mere form and mechanics of what we do without a reasonable explanation and without understanding on the child's part. A child should be taught to interest himself in the care and use of his mouth and teeth from his first visit to the dentist, but the real work and responsibility must rest with the parents until the child is capable and appreciative enough to care for his own mouth, to stimulate and exercise the tissues and to ever be watchful for the beginning of dental trouble.

One of the causes of periodontoclasia is controlled and corrected by that most abused and largely misunderstood and unappreciated specialty, orthodontia. In my practice and experience, I think that one of the most frequent and fruitful causes of malocclusion which make for future periodontal disturbances in adult life comes from the too early loss of deciduous teeth, without the use of suitable space retainers. I have also found that a goodly percentage of children who never lose a deciduous tooth until almost time for normal replacement by the succeeding permanent tooth need orthodontic treatment because of other conditions present. Let us refer our cases to the orthodontist when we should, work with

him and share the benefits to be gained for the child.

I would urge the periodontist to insist on the dentist's doing the necessary operative work, that he spend more time in diagnosis, and that he consider the mouth as a whole, and not just the one tooth that he is restoring or extracting. Every filling inserted, every tooth extracted considerably affects the mouth, as time will invariably prove. In children's dentistry, the selection of filling materials is indeed a big problem. I would advise every man to use that material which he can manipulate best, but to use a material which will not be worn away appreciably by mouth fluids or attrition, a material which will aid in reproducing the occlusal incline planes and one which will certainly protect and keep normal the gingival tissue. I use a high-grade silver alloy. Every cavity is carefully prepared, to insure retention. A sterilizing solution is used, a protective anodyne base is inserted and the filling is always inserted, to assure permanency, and to reproduce normal form and function, it is carved, contoured and polished.

Every tooth should be kept serviceable in a child's mouth. If a tooth is sore or abscessed or function cannot be restored and maintained, I feel that, for the general health of the other teeth and tissues, the condition should be cleared up by an extraction. I do not hesitate to remove an abscessed tooth at any age, because I believe that the disuse and liability of causing approximating teeth to decay, become sore and inflamed, together with the much discussed focus of infection which a child of all people can ill-afford, warrant me in this procedure. Care must always be exerted to maintain spaces, have proper alinement and secure normal arch development.

The child from 3 to 12 years of age undergoes the most serious and trying growth period of life. In this age, the far-reaching epidemic and infectious diseases are met. At this same time, the nervous and digestive systems are in a stage of growth, and future body immunity is being builded then as at no other time. We must needs be impressed with the fact that habits and thoughts are established and formed at this time which last throughout life, to help or hinder our quest for health.

I cannot stress too forcefully the importance of establishing and maintaining a strong tissue tone and immunity through periodic prophylactic treatments; the wise and adequate proper home care of the patient's mouth; the importance of proper mastication, chewing on both sides of the mouth, and the continuous stimulation and exercise of the gums and teeth with toothbrush, finger and dental floss, if indicated or thought necessary. Every cavity no matter how small, should be filled, the occlusal surfaces of all first permanent molars especially should be watched and filled, if necessary, for permanence, and every patient should be taught that the health of his own mouth depends on him and not you. We should eternally strive to avoid large and unnecessary bridgework. Diet has a not to be denied place in the prevention of diseases that we are especially concerned with, and we fail as doctors of dental surgery unless we avail ourselves of the knowledge that we now have on diet and nutritional problems, and then insist on utilizing this knowledge in practice.

CONCLUSION

I have brought you nothing new: there is nothing new, but many old truths are still unearthed and unused. I have

offered you no specific cure-all; in your specialty, no one thing can be a cure-all. You must study and eliminate every possible etiologic condition and surely they are myriad. I have tried to make you think of the great, and not to be denied, part honest children's dentistry plays in preventing periodontoclasia and the manifold other ills our race is heir to.

To cure periodontoclasia is hopeless and impossible; to prevent this condition is your only hope. The proper care of children offers you your greatest avenue to work for the elimination of your specialty, which I am sure must be the ideal of every periodontist. I am sure that serving children will help you to eliminate many problems that you are forced to attempt to solve. Will you not give to children the consideration they deserve, thereby winning your own self-respect, and having a cup that eternally overflows because of the joys which come from serving the most appreciative patients that we meet—children?

720 New Street.

USE AND APPLICATION OF ANESTHETICS IN THE PRACTICE OF CHILDREN'S DENTISTRY*

By CHARLES A. SWEET, D.D.S., Oakland, Calif.

WHAT constitutes the practice of children's dentistry?

Children's dentistry is a general practice of dentistry dealing only with children from birth to the age that all deciduous teeth are normally lost, which is the twelfth or the fourteenth year. We therefore are considering only the twenty deciduous teeth, the four first permanent molars and the eight permanent anterior teeth. At the time of the eruption of the cuspids, bicuspids and second molars, we must consider the patient as no longer in the field of children's dentistry.

The use of any anesthetic in cavity preparation for children is contraindicated and is unnecessary. A better understanding of child management is the proper anesthesia for this phase of children's practice. Anesthesia is indicated for children only in the extraction of teeth or other surgical procedures.

EXTRACTION OF DECIDUOUS TEETH

Deciduous teeth that are about ready to be normally lost and are a source of annoyance to the child should be lifted out, and nothing other than a surface anesthetic with pressure is necessary.

Exposed and pulpless deciduous teeth with or without fistulas, in the majority of cases, should not be extracted, but, when properly treated, can be retained to the time when they should be normally lost.

A pulpless deciduous tooth should be extracted when (1) caries has penetrated the bifurcation of the roots; (2) two-thirds of the root or roots has been absorbed because of either the pathologic condition or normal absorption; (3) a

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 24, 1930.

fistulous opening is at or around the gingival margin of the tooth.

This, no doubt, will be a new conception of the pulpless deciduous tooth to you who are practicing the specialty of extraction and oral diagnosis, but I can assure you of the soundness of these three indications for extraction as they are based on not only my own work but also that of several others devoting their time exclusively to the practice of children's dentistry.

In case one of these three conditions is present, extraction is indicated. What should we use as an anesthetic? Surely, with so simple a case, nothing other than a local anesthetic would be considered. The anesthetic is always applied distally of the tooth to be extracted, both buccally and lingually. Infiltration is rapid in both maxillae and mandible.

Vital deciduous teeth that are retained for a longer period than the orthodontist deems advisable, or vital deciduous teeth that are injured by accident, such as a fracture in the middle third of a root, should be removed with the greatest deliberation, so that no remaining root fragments may be left to set up an infection or deflect the erupting permanent tooth. The assistance of the patient is of great value to the one charged with the task of performing this operation, not for a few years but for almost a lifetime. Cooperation of the patient and deliberate care on the part of the operator can be secured only by the use of a local anesthetic.

EXTRACTION OF PERMANENT TEETH

The extraction of the first permanent molar should be done with as little destruction of process as possible. Also, the fact that injury may be done through the desire of the operator to remove all roots at one time cannot be emphasized too strongly, and such an heroic effort as this may not only result in injury but also have a lasting effect on the attitude of the child regarding further dental attention. All multirooted permanent teeth should be removed a single root at a time with as little apparent effort by the operator as possible. Only with the cooperation of the child and ample time for the operator to survey the situation with care can this be accomplished. Local anesthesia either by infiltration or conduction fulfils these requirements.

CHILD MANAGEMENT

Many of you no doubt feel that it is difficult to use a local anesthetic in child cases because the management of the child is your greatest problem, and if a general anesthetic is administered, you can then forget the management of the patient. But whenever a general anesthetic is given for the removal of teeth, not only is cooperation of the patient lost but there is also a nervous tension on the part of the operator that may result in the incomplete removal of all roots or diseased tissue. If an operator has no confidence in himself, how can he expect confidence to be shown by a child, who is ever skeptical as to what may happen to him in a dentist's office, especially if he has heard, as he very often does, some of the experiences of his elders. Offices should be cheerful, and everyone can well afford to wear a smile both internally and externally as we can never deceive a child, no matter how false a face we may wear. Children always shoulder responsibilities well, so we should not hesitate to tell them honestly what is going to take place. Let us expect their cooperation and we will not be disappointed. Above all, we must endeavor

not to bluff, as the child is capable of reading us like an open book.

REFERRED CASES

Many times, I have been asked what one who is practicing the specialty of extraction should do when a case is referred to him to have a deciduous or permanent tooth removed and he feels there is a possibility of retaining that tooth in good health for its allotted time. Is he to follow the instructions of the man who has referred the case? In the first place, it is wrong to order the tooth out, and, in the second place, it would be wrong to remove it, and in no instance do two wrongs make a right. Many of you may say that there is no dentist in your community who will care for children properly; but is not that in some degree a reflection on you? If you and the other dentists in your community would put your shoulders to the wheel and either care for children properly yourselves or support some one who is willing and desirous of caring for them, the question would be answered. Those of you who may be making oral diagnoses should be qualified to give a competent opinion regarding the possibilities of retaining teeth for children, and should not follow the dictates of one in the general practice of dentistry who does not profess to be a diagnostician.

In the examination of about 1,600 children since Jan. 1, 1930, it has been necessary to remove four first permanent molars in each case referred to an extractionist, and a local anesthetic was administered by choice. There have been nearly 100 deciduous teeth removed, but only in eight cases was it necessary to use a local anesthetic. I am giving you these figures in the hope that you may realize as I do that far too many teeth are extracted for children.

CONTRAINDICATIONS FOR THE USE OF LOCAL ANESTHETICS

Most mental cases should have administered a general anesthetic of ether, nitrous oxid and oxygen or ethyl chlorid, according to the length of time necessary for the operation. In surgical cases, such as cleft palates and fractures, a general anesthetic should be administered.

If a general anesthetic is necessary, the case usually should be hospitalized and not attempted in an office.

CONCLUSION

1. A local anesthetic is preferable for extraction of teeth in the practice of children's dentistry, because: (*a*) The operator will be given time to stop, look and listen. (*b*) It will necessitate a better understanding of child management. (*c*) It will assure the operator the child's cooperation, and this is invaluable in most cases. (*d*) It will build up in the child a confidence in dentists and dentistry that will mean much to the child in later life. (*e*) It will mean a better result, as there will be less opportunity for root fragments to be left behind or other disease conditions to persist.

2. All deciduous teeth with exposed pulps can be saved, to serve their allotted time in the mouth.

3. At least 75 per cent, and possibly 95 per cent, of all pulpless deciduous teeth can be saved to serve their allotted time and, as far as is now known, they will remain in a healthy condition.

4. If the child is treated as if he were a man, and not given lolly pops, management of the case will be indeed simple.

5. Encourage children's dentistry in your community, and there will be less necessity for the use of local or general anesthetics.

DISCUSSION

O. A. Kelly, St. Louis, Mo.: When Dr. Sweet says definitely that all temporary teeth with the pulp exposed can be saved with the exception of those that fall into three classes, which he enumerated, he makes a broad statement; because, many times, children are brought to us who have any number of pulpless teeth and their general health has to be taken into consideration. It would be impossible to render dental service to that type of child without risking his life. In many of those cases, it is absolutely essential that we take out the teeth. With one statement I heartily agree: we do need a better understanding of child management, and the child can read our minds like an open book. Often when parents bring children to me for the removal of teeth, they say, "Don't tell him that you are going to remove the tooth." I say, "I might lie to you, but I would never attempt to lie to your child. We will tell him exactly what we propose to do." Children are brought in in hysterics, and when we tell them what we are going to do, they become calm and do just exactly as we ask them to do. In my practice, which is limited to surgical work and the removal of teeth, probably 70 per cent of the work is done under local anesthesia. But when Dr. Sweet says that, in the majority of cases, local anesthesia is indicated for the removal of teeth for children, I disagree. We can get the cooperation of the child for the administration of a general anesthetic just as we can for administration of a local. Anyone who will take the time to gain the confidence of the child and tell him exactly what is to be done will be able to get him to take the anesthetic. He will permit you to adjust the face piece just as he will permit injection of a needle. Another thing mentioned as a contraindication for the use of a general anesthetic in children is the lack of confidence the operator may have in himself because of lack of time. If one has not confidence in himself when he undertakes an operation of any type, he should send the child to someone who has confidence enough in himself to do it.

J. W. Seybold, Denver, Colo.: What is this cooperation? And why do we need it? We don't need to have the patient reach over to spit in the cuspidor. It takes time. It is septic. I say that we do not need cooperation of any patient. In a laparotomy, do we have patients reach down on the table, turn the wheel and put themselves into the Trendelenburg position? We do not need cooperation with any general anesthetic, and why do we need cooperation in an operation of any kind? We want to wall off the tissues and operate as cleanly as possible. This deliberate operation is more easily done under general anesthesia than is possible under conductive. We do not have to hurry. We perform all types of operations under a general anesthetic, and this idea of getting the cooperation of the patient is all nonsense. All we have to do is to turn the head whichever way you want it. That is easily done with the tips of the fingers. What do we want cooperation for, and why cannot we be deliberate and do anything we like? I cannot see why, with the general anesthetic, we cannot get out those fine spicule roots that we find in deciduous teeth, when we have the permanent teeth coming up between. We certainly can, and so avoid that dreaded needle and the distasteful sensation as well. I do agree regarding proper management of children. If you do not lie to them, they will permit you to do almost anything. They are as a whole better patients than adults. When the hysterical child comes into the office and finds out anything is to be done, he may run out of the office. After the parent brings the child back, we take charge, and have no trouble in getting him into the operating room. If the parent says, "It is not going to hurt you," I say, "We are going to tell this child just what we are going to do, and we are going to do it that way, and you must stay out of the operating room. When you are in the operating room, the child thinks you will sympathize, and it makes him hysterical." When we apply the anesthetic, we talk to the child all the time in a nice low voice to win his confidence, and as the child is losing consciousness, he gains confidence. I cannot see why we want to use a local anesthetic for extraction of teeth in children up to 15 years of age. Have them "stay put" so that you can work, and we can "stop, look and listen" to our heart's content when we have them under a general anesthetic.

E. L. Thompson, Jacksonville, Fla.: I am pleased to note that others, as well as myself, are using topical remedies for extracting loose deciduous teeth, with a little pressure. When an anesthetic is necessary, I give nitrous oxid and oxygen in combination with carbon dioxid to all of my patients, children 7 years and up.

As far as the cooperation of the patient is concerned, as soon as patients come in, I begin to talk to them, trying to gain their confidence. If we have the hysterical child to deal with, we place the chair as soon as we can; remove the nose piece from the tube and turn on the nitrous oxid, at the same time assuring the child that I will not do anything to harm it. I have my thumb over the end of the tube, allowing the nitrous oxid to escape, and in a few moments the child is in a state of analgesia. We have no trouble. As to the children having no confidence in me afterwards: I find that 99 per cent that are frightened when they come to my office are perfectly willing for me to take out teeth again for them when it is necessary. I am as radical on the removal of deciduous teeth as I am regarding permanent teeth. My practice ranges from the richest to the poorest. I find that many children of all classes come in with nerves exposed, and I feel that I render a better service to the child if I take out the affected teeth and, if the parents can afford it, have them go to the orthodontist and let him put in a space retainer. If the parents cannot afford that, they cannot afford to have root canal work and other work carried out as will be necessary.

L. N. Ellsworth, Salt Lake City, Utah: Ethyl chlorid has been a boon to me in the last twelve or fifteen years in the extraction of deciduous teeth. I have used it especially to develop the technic that I have employed in more than 1,000 cases, and if you wish to make friends, you should try it. It has been a success in every way. The child patient comes back to you the next time a friend, instead of an enemy. I never use a local anesthetic for a child, although I have had parents urge me to do so.

A. W. Petty, Ogden, Utah: I speak as a general practitioner. I believe that there are too few men in the dental profession today who are devoting their serious attention to the control and management of children's practice. In the matter of local anesthesia, I concur with Dr. Sweet as to its use for the removal of the deciduous teeth. In the preparation and filling of deciduous teeth, also, I have used local anesthesia. Perhaps nothing is so dreaded by people who frequent our offices as the drill. If we can overcome during the early years of a dental experience the dread of this procedure, we can establish in the minds of young as well as adult patients a confidence that cannot be overestimated. In my own little boy 6 years of age, I have used this method with a prayer in my heart that I could establish in his mind a confidence in me that would permit me to care for his teeth without fear and without dread. And in placing inlays in his deciduous teeth, which I have done under local anesthesia, I have seen him acquiesce to my slightest desire in handling his case. With many others, I have had a similar experience, and it is for this younger generation that we must use every means at our command. I fail to see why the use of local anesthesia is not justified if as judiciously used in the handling of our child patients as it is in the handling of our adult patients.

Charles R. Hocker, Ponca City, Okla.: I am not an exodontist, but a general practitioner. Dr. Sweet is not exceptional in his ability to prepare cavities in children's teeth without a local or a general anesthetic. When I heard the late Dr. Phil Thomas make the statement that cavities could be prepared in children's teeth without hurting them, I was very skeptical. Two years later, I heard Dr. Barker and Dr. McCrum make the same statement. I tried it, and found that it is not necessary to use any kind of an anesthetic to prepare a cavity in children's teeth. It is merely the operator who needs the anesthetic, if anybody needs it.

E. W. Browning, Salt Lake City, Utah: Dr. Ellsworth advocated the use of ethyl chlorid. I recall that Dr. Sweet mentioned ethyl chlorid, but I cannot believe that any man who evidently condemns general anesthetics as Dr. Sweet has, such as nitrous oxid, would in the same breath advocate ethyl chlorid. I should like to ask Dr. Sweet whether he uses ethyl chlorid as a spray or as a general anesthetic.

M. Hillel Feldman, New York City: I have always been an advocate of general anesthesia, especially for children, but in recent months I adopted ethyl chlorid as a general agent for children. I have been strongly encouraged to do this by James T. Gwathmey, of New York. He has told me there is no danger, comparatively speaking, in using the ethyl chlorid as a general anesthetic in patients up to the age of probably 12 or 13. George Moriarty, of Middlesex, England, told me that he administered ethyl chlorid to both children and adults 10,000 times without a single case of anxiety on his part, or

distress on the part of the patient. From personal experience in my own mouth, I do not believe in the use of ethyl chlorid as a spray on tissue because I have found that there was severe postoperative inflammation from dehydration during the spraying. In using ethyl chlorid as a general anesthetic spray, there is a danger of spraying some of the fluid into the eyes. If you will adjust a piece of rubber dam to the size of the child's face and cut an opening simply to permit exposure of the nostrils and the mouth, and place several strips of gauze between the rubber dam and the child's face, having the entire dam and gauze cover the child's eyes, you will permit the spray to enter the area of the nostrils and mouth only, and not interfere with the eyes at all. I do not believe that it is necessary to watch the reaction of the eyes in any general anestheitc, as I consider that breathing is the sole dependable index. A child often will expel a mouth prop, but this method of application requires no prop. If the child cries, the spray is discontinued as soon as the crying ceases. Do not continue it for another second because ethyl chlorid continues to carry the child deeper in anesthesia for a few seconds. If the child does not cry, ask him to begin to count, and discontinue the spray as soon as the counting is discontinued. You will have no difficulty and, as Dr. Seybold has said, that is all the cooperation you need. You can do the rest.

M. R. Howard, Denver, Colo.: There is a little difference in the application of this subject, particularly as regards the use of general anesthesia versus the use of local anesthesia, depending on whether one is familiar with the use of a general anesthetic or familiar with local anesthesia. Perhaps the general practitioner does not use general anesthesia at all. If he is a specialist, he probably uses gas-oxygen to greater advantage. It has been the general expression of those discussers preceding me who are specialists that the use of gas-oxygen is the preferred method for anesthesia of children for the removal of teeth. I am in agreement with these speakers in that particular respect, but my experience may have been different from that of the general practitioner. In the final analysis, the choice should depend on the particular ability of the person handling the case. If he believes that he can do the work better with a local anesthetic, that method should be the one of choice; if he feels that he can do it better with a general anesthetic, that is the better way for him. For the child between the ages of 4 and 11 who has an aching tooth or some other trouble demanding immediate attention, premedication might be impossible, and, in that event, general anesthesia is far preferable. I do not wish to condemn the other method too strongly. We gain the confidence of the child by having a quiet talk with him, explaining what is causing his trouble. He is persuaded to "blow hard" at the beginning of administration of the anesthetic, with the idea that we are having a contest, with a little prize offered, to see which child that comes into the office can blow hardest. He is also told that in this way he will help us to get rid of the "little bugs" that are causing his trouble.

Theodor Blum, New York City: I have been practicing my specialty for nearly twenty years and I still find it very difficult. Dr. Sweet did not quit oral surgery because it was easy, but because he did not like it, and he does like to work for children, as we can see in every line of his paper. It is true that if we know how to handle children, it is much easier to work for them than to work for adults. I recall a rule which was given to an audience by Dr. Ottolengui: "You will get along very well if you treat adults like children, and children like adults"; and that is true. Just try it.

Dr. Sweet: I want to thank you for the discussion of this paper because it has all been sincere. I wish to say to Dr. Seybold that I appreciate everything that has been done by older men in our profession. I have many friends in Oakland and San Francisco, older men who have helped me, and I appreciate their counsel just as I appreciate my father's. The one point that I wanted to bring to you is that the children of America need better attention. If I have done nothing else, I have caused you to think of children. I am going to tell you something about my associations so that you may realize that I have not just tried to "start an argument" in this section. I am not talking to you just as a dentist practicing children's dentistry: I am one of a group doing children's work in the city of Oakland. I have a brother who is a children's physician. The February, 1930, issue of the *Journal of the American Medical Association* carries an article on children's dentistry by him. I have a brother who is an orthodontist who checks up on my work and

tells me of my shortcomings. I have another brother who practices dentistry among adults. When I get through with these children, some of them go to him. He has the opportunity to observe the permanent teeth of children who have had pulpless deciduous teeth retained in their mouths and to judge the success or failure of this treatment. I have slides covering from eight to ten years to prove that pulpless deciduous teeth in most of the instances can be saved. You can produce similar results if you are willing to develop your technic and have an open mind. True enough, I like children, but I do not like them any better than anyone of you in this audience. Probably, no human being outside of prison today who really dislikes children should be outside prison. You may think that some of us have corralled all of the ability to care for children. Any one of you who has a child of your own knows that is not so. As to the question of anesthetics, if you are giving proper service to children, it matters not whether you use gas, ethyl chlorid, local anesthetics or ether. I am not pleading so much for consideration of the anesthetic as I am that you consider the statement I made in my paper that when a man in the practice of dentistry orders a deciduous or a permanent tooth out, and it should not come out, that is the first wrong. When you who are practicing exodontia and oral surgery follow the dictates of the man who has ordered a tooth out wrongfully, that is the second wrong. I am appealing to you to assist us who are interested in the promotion of children's dentistry in the United States; to take better care of the children in your community, and to give them a better chance to grow up to healthy manhood and womanhood.

EDUCATION FOR THE PRACTICE OF ORTHODONTIA*

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HOW may men be trained best for the practice of the specialties in medicine and in dentistry? In medicine, a very large percentage are practicing some specialty, yet our medical schools are giving little training to qualify one to enter any one of the many specialties. The same situation exists in dentistry, although the percentage who enter special fields is much smaller. In 1906, our medical schools began a house cleaning and reorganization program which occupied their attention for many years, and resulted in the establishment of a standard minimum of entrance requirements, a fairly standard four-year course, and, more recently, a year of hospital internship, all to be completed by the candidate for an M. D. degree. This entire program is designed to qualify one for the practice of general medicine. In some schools, there is an opportunity to take certain electives during the senior year, and, in many hospitals, an intern may devote more than the regulation time on a service in which he is especially interested. However, there is no adequate provision, under the most favorable arrangement, to justify entering practice as a specialist.

Some young practitioners associate themselves with an experienced specialist for several years, until they feel qualified to enter his chosen field on their own account. Others start in general practice, but pay especial attention to one line of service, gradually giving up general practice as the income from practice of the

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special line increases. Others specialize by hanging out a sign. There is no minimum standard of qualification for a specialist in any line, and no guarantee to the public that one who announces himself as a specialist is really able to give the service which the public has a right to expect.

Years ago, the apprentice system of preparation for the practice of both medicine and dentistry was in vogue. A student "rode" with a doctor to learn the practice of medicine and, after a time, struck out for himself. Subsequently, laws were passed which prescribed a term of apprenticeship preliminary to a licensing examination. Gradually, the apprenticeship plan was replaced by the requirement of attendance and graduation from medical school. Dentistry has followed the same general program.

Some of the outstanding figures in both medicine and dentistry in the early days were apprenticed men who, by their own efforts, outstripped those with whom they had been associated; yet general recognition of the fact that the apprenticeship plan was too much a matter of hit or miss, that it really guaranteed nothing in the way of a minimum education and training, led to the passage of laws which gave the public a guarantee of a minimum requirement.

The specialties of both medicine and dentistry might be said to be today on the same basis that the practice of general medicine was before laws required even an apprenticeship service. The law permits a man who has an M. D. degree to practice anything in the entire field and to announce himself as a specialist, although the training which leads to the degree certainly does not qualify him to practice any one of the specialties. He gets his special training as best he can, even though it be by the hard road of experience; and while experience may be the best teacher, the general public would be much better off if at least a year or two of experience for the practice of a specialty was gained under the direction of competent teachers. There is no doubt that the young physician who is fortunate enough to secure an association in practice with a man of outstanding ability may become thoroughly qualified to practice a specialty, just as, in the apprenticeship days, the man who was fortunate enough to "ride" with a doctor of ability and parts may have gained a better medical education than at a medical school. Yet the public is entitled to some assurance that every physician and every dentist who specializes shall have had requisite training.

During more recent years, some of our medical schools are offering special courses; also, a limited number of special schools have been established for the education of men for practice of the specialties in medicine. It seems likely that this trend may continue until adequate training is provided and is made a prerequisite for the practice of each of the specialties. A sign of this trend is the passage of an act by the Parliament of Alberta which requires that one must present evidence of having taken approved courses before being permitted to announce himself as a specialist. This law applies to the specialties of both dentistry and medicine.

Let us for a moment consider dentistry as a specialty of medicine. The best dental schools today give their students, during the first two years, a foundation of medical knowledge which far surpasses that given in the average medical school twenty-five years ago, and which approaches that of the best medical schools of today. To this is added the special study of the oral field and the technical

training which makes the dental graduate better qualified to step out into actual practice than is the medical school graduate. It is as though one had taken the basic medical course as his foundation and had then devoted two years to qualify for the practice of dentistry as a specialty.

Medicine will gradually add more opportunities for training in the specialties, which will be comparable to our dental school training, and dental schools will gradually give a broader medical foundation. Possibly there will some day be no general practitioners of medicine, and every practitioner will be required to spend two years beyond the regular medical course to qualify himself for the practice of a specialty. If such a time arrives, it seems possible that all practitioners of both medicine and dentistry may take the same basic medical course, to be followed by attendance at a school where specialty training will be given.

Opposed to this suggestion of future possibilities, is the belief on the part of many in both the medical and the dental field that one should have at least five years in general practice before taking up a specialty. This gives one that broader view which is so important to an understanding of the interrelationships of various physical and pathologic conditions; conversely, it tends to prevent the specialist from becoming too limited in his point of view, because of lack of knowledge of related fields.

Some years ago, when I was secretary of the Section on Stomatology of the American Medical Association, I attended the annual meetings of the secretaries of all sections, held at headquarters in Chicago. At one of these meetings, each secretary, representing his specialty, reported the program that had been arranged for the forthcoming annual meeting of the Association. The titles of most of the papers indicated that they were within the limits of their respective fields, and when all the reports had been made, Dr. Frank Billings, a trustee of the association, who had been an interested listener, arose and spoke of the sectional programs as likely to be of interest to the members of each section, and then made the significant remark, "But I wonder who is taking care of the patient nowadays." He thus placed emphasis on the modern trend by which the specialist is divorcing himself from knowledge of the general field, and thus depriving himself of contacts of much importance which have a direct bearing on his own ability in both diagnosis and treatment. It is for this very reason that a few years of general practice, in either medicine or dentistry, is considered of advantage to the specialist.

In this paper, we will consider dentistry with its specialty practice as having developed along lines similar to medicine and its specialty practice. Let us presume that the colleges of both medicine and dentistry are giving excellent training for general practice, and also acknowledge that, with few exceptions, neither group is offering proper training for the practice of the specialties. The question then arises as to the practicability of continuing the associate or apprenticeship plan of training specialists, it being recognized that so long as that plan is in vogue, many will become specialists by hanging up their signs and will learn by the sad experience of their patients. Will it not be better to encourage the dental colleges to develop plans by which trained teachers of fundamentals and clinicians of experience shall give systematic training that will adequately cover each specialty field?

One other important element must be considered: the number of specialists in

any field in relation to the number of persons to be served. If there were a sufficient number of specialists, satisfactorily distributed, it might be practicable to have a law which would not only require a special course of training for each specialist, but also prevent others not so qualified from doing anything in the field of the specialists. This might seem to offer the best guarantee of good service to the public. As a matter of fact, it would be entirely impracticable to even think seriously of recommending a law which would deprive the general practitioner of medicine or dentistry of the privilege of doing any service within his field, as long as there are not enough specialists.

Let us confine our further consideration to orthodontia. The modern way of approaching this question would be first to determine the need and the demand. The difference between need and demand is a matter of education and finance. If the parents of all children who need orthodontic service were properly educated to that need, and were financially able, the demand would be the same as the need. It is doubtful that approximately accurate figures are available as to the need of orthodontic service. Some school surveys place it as high as 70 per cent. We do know that the need is tremendously greater than the demand. We know that the actual demand is in large measure reduced by financial limitations of parents' pocketbooks. We also know that there is at least a limited demand, that cannot be satisfied, in locations where orthodontic service is not available. It seems perfectly obvious that for many years to come large numbers of children must receive orthodontic service from general dental practitioners, or go without.

What should be the obligation of the dental college? Should orthodontia be taught by lecture and demonstration only, and thus each graduate be placed in the position that he must have additional training if he desires to devote a part of his time to orthodontic treatment? Should there be a course consisting of both didactic and clinical training, comparable to the courses in operative and prosthetic dentistry and intended to give each graduate a good basis for continued individual study, which should enable him to care for cases of orthodontia as a part of his general practice? Should our schools also give postgraduate or graduate courses sufficient in time and content to enable dentists who graduated under either of the other plans to qualify as specialists?

As the administrative officer of a dental school, I am anxious that my school do its full duty to the profession and the public. This paper is presented principally for the reason that there appears to be a wide divergence of opinion among our specialists in orthodontia, and this lack of harmony is reflected through them in our dental schools.

Important changes are taking place in the general trend of the dental college program, and orthodontia should have consideration in this revision. In the early days, our colleges taught little else than the technical procedures calculated to maintain the patient's ability to masticate. Gradually, the local and general health relationships led to studies in anatomy, physiology, chemistry, pathology, bacteriology, etc., and dentistry became a part of the healing art. Today, in association with medicine, we are undergoing an even more important change. Most dentists have not yet realized it, partly because they are unwilling to try. They cannot visualize the gradual

changes that are already occurring in practice and the bearing that these will have on income. Reference is made in the change toward preventive treatment.

The greatest specialist of the future will be the one who is able to keep his patients in good health by periodic examination, education and the minimum of treatment. This is as notably true of dentistry as of any other field of health service. It means that the dental college must devise means of creating and maintaining in the student's mind the picture of a normal, healthy mouth, to the end that his main objective shall be to keep each mouth as nearly normal as possible. It begins with early childhood and follows through to adult life. It means that the student must come to think of both professional and financial success in terms of prevention rather than in terms of so much per inlay or crown or denture. It does not mean a sudden radical change from present practice; it does mean a gradual change, which should be progressively greater each year.

May I remind this audience, most of whom are interested in orthodontia, of the opportunity before the professor of orthodontia, in cooperation with the professor of operative dentistry, to emphasize the value of normal occlusion of both the deciduous and the permanent teeth, which makes for normal function of the teeth and investing tissues, as the base of the pedestal on which the dental college program should be built? How much would all other dental service be simplified if every dentist would consider it a part of his duty to educate mothers in regard to the many things which tend to prevent irregularities of the teeth? How helpful would it be in preventing irregularities if every dentist took proper care of the deciduous teeth? I am endeavoring to emphasize the fact that the normal mouth of the child should occupy first place in the mind of the student; the normal mouth of the adult, the next place. Then should come all of those things which make for normal development and maintenance, and, finally, the technical procedures which are necessary to restore normality, when decay and other diseases do occur.

In its immediate application, this program represents a difference in thought and attitude rather than a difference in practice. In time, practice itself will gradually change. This trend must be kept in mind in discussing plans for orthodontic teaching, because it means that the orthodontist must get closer to the general practitioner, rather than follow the present trend of developing separately. The general dental practitioner and not the orthodontist is the one who can do most to prevent malocclusion, because cases are not referred to orthodontists until a deformity is apparent.

At least one other important factor in training for the practice of orthodontia should be mentioned, the factor of time. Many cases require attention over a period of several years, and it is unquestionably desirable that a student see at least a few cases through from beginning to end. All principles may be taught and cases in all stages of progress may be demonstrated within a few weeks or months, but there can be no adequate substitute for the time element in preparation for orthodontic practice.

The situation now confronting the dental college may be stated as follows:

1. The need for orthodontic service is very great, available surveys estimating that possibly 70 per cent of children under 10 should have orthodontic attention. This is almost as high a percentage as that of children who require attention for dental caries.

2. The actual demand for orthodontic service is much greater than can be met by the present number of specialists.

3. Probably more cases of orthodontia are being cared for by general practitioners than by specialists.

4. The present demand should be tremendously increased through education.

5. Many young adults seeking orthodontic service are not accepted for treatment by specialists, and the majority of these are unsatisfactorily treated by general practitioners.

6. All practitioners of dentistry should be acquainted with the possibilities of prevention and the advantages of early treatment of orthodontic cases.

7. There are possibly 600 dentists in the United States who are specializing in this service. The orthodontic training of these men in dental school was generally quite inadequate. They have further developed their ability (1) entirely by their own efforts; (2) by some form of association or apprenticeship; (3) by taking postgraduate courses of from six weeks to three months; (4) by hanging out a sign. Taken as a whole, this group presumably is giving the best service.

8. An unknown number, probably many thousands, of general practitioners are devoting part time to orthodontic treatment. The quality of this service doubtless varies all the way from very good to very bad. The majority of cases are probably not well treated.

9. From 3,000 to 4,000 cases are under treatment by our dental colleges and other clinics. These are largely cases of neglected mouths and are, for the most part, very difficult.

10. There appears to be no prospect that orthodontic specialists will for many years to come be sufficient in number and so located as to care for more than a small percentage of those who will demand service.

If these statements are a fair summary of the orthodontic situation, there is no question that, for years to come, many general practitioners will devote part of their time to orthodontic service, and more specialists will be required, particularly in cities of moderate size. It is important that every dentist, even though he never treats a case of orthodontia, be so well grounded in this work that he may do his share in promoting preventive measures. Every student should have sufficient orthodontic education and training that he may, on his own initiative or with some outside help, continue his studies and qualify himself to make this service a part of his routine practice.

A DENTAL SCHOOL PROGRAM

The training of dental specialists as well as undergraduates should be the obligation of our universities. In possibly a dozen dental colleges, the teaching staff should be organized and facilities should be available for both graduate and undergraduate teaching. In all others, an undergraduate course should be given. It is not the intention to present in this paper the detail of courses, but to make suggestions relative to a program.

In the undergraduate course, orthodontia should be what might be termed a major subject, paralleling operative and prosthetic dentistry in many respects. The study of orthodontia should begin in the freshman year with oral anatomy, embryology and physiology, the main objective being to impart an understanding of normal development, normal occlusion and function of the deciduous teeth, and of the permanent teeth—a picture of the dental ideal of a healthy mouth. In the sophomore year, there should be a lecture course in the fundamentals of orthodon-

tia, and a technical laboratory course in impression taking, preparation of models and the making of appliance units selected to emphasize the variations in technic. In the junior year, the principal course of lectures covering diagnosis and treatment should be given, accompanied by further experience in appliance making. During this year, the student should begin his clinical experience. Few teachers of orthodontia would feel justified in assigning an orthodontia patient to a junior student for treatment, but would prefer to assign the student to a patient who is already assigned to an instructor. The student would then serve as an observer and assistant to the instructor. The greatest value in this arrangement is that it gives the student early opportunity to observe cases and he may have two years of contact with clinical procedure while in school. In the senior year, the lecture course should consist of a review and amplification of studies of diagnosis and treatment given during the junior year, with the addition of case histories. This should be supplemented by some form of seminar studies calculated to increase the student's interest and broaden his point of view of the orthodontic field. This work should point the way to future study. During this year, one or more cases should be assigned to the student and an instructor jointly, and the student should be required to carry at least a minor share of responsibility in the care of patients. Throughout the entire course, the possibilities of prevention should be constantly emphasized, particularly in connection with the discussion of etiology.

For the practitioner who intends to specialize, no course of less than one school year is recommended, as that is believed to be the minimum time that should be devoted to this special training. Half time for two years is preferred to full time for one year, particularly for the purpose of giving a longer period for observation of cases. This course should include everything in the undergraduate course, plus special lectures on subjects related to the orthodontic field, and at least one line of investigation, to be carried out largely on the initiative of the practitioner-student, including the preparation of a thesis. The largest practicable amount of clinical training should be included, and attention should be given to mouths of young adults.

Postgraduate courses of two or three months' duration should be offered for small groups of practitioners of experience, to give them an opportunity to bring themselves up to date. Short courses are not recommended for those who have not had a considerable experience with orthodontic cases.

To carry out such a complete program of undergraduate and graduate instruction, a school should have a competent staff, sufficient in number to take full care of all cases accepted for treatment. There should preferably be a full-time head of the department. The department should be well organized and should have ample rooms and equipment for both laboratory and clinical work. Experience has proved the advantage of having separate rooms for graduate students. If these can be adjacent to the undergraduate clinic, opportunity will be afforded for observation of cases under treatment by either group, and thus the interest and training of both be enhanced. There should also be ample provision for research.

DISCUSSION

Marcus L. Ward, Ann Arbor, Mich.: Dr. Black says that large numbers of men practice both in medicine and in dentistry without special training. There is no doubt about

that, and no one need doubt the success of some of these specialists. We have become so accustomed today to think that the schools must do everything perfectly, that the students must be so trained that they will be 100 per cent perfect. All of us have learned much that we were not taught at school, and many leading orthodontists got their training outside of the school. The fact that we do not have this specialty in our schools today in a state of perfection is not at all alarming. Not that we are not going to develop it; but we have just as many good orthodontists today as knowledge of the subject will permit. In the last three or four years, I have given a considerable amount of attention to the proficiency of dentists when they leave our dental schools as compared with that of engineers and medical and law graduates, and there is no one who is giving this matter attention who would disagree with me when I state that of the four groups the dentists are the best prepared when they leave school. No one would want to employ a lawyer on an important case when he first leaves school; no one would employ a physician to perform a major operation, and no one would hire an engineer for an important job; but the dentist is supposed to be perfectly trained when he leaves school. Therefore, the demands which are made all the time for more and more proficiency do not appeal to me as they do to some. Equip the man so that he may go out and grow into any one of these positions, as some of you men have gone out and attained great proficiency today. This makes a greater appeal to me than this idea of tremendous proficiency at the day of graduation. The relation of the number of specialists in any field to the practice to be served is a thing that none of us can ignore. There are great bodies studying that problem today, under able instructors. I may have contributed a little to the study of that problem. We cannot always ignore the needs of the many and make no preparation to meet them. For that reason, one thing which Dr. Black has presented here today is an open topic for discussion, and will be for many years; that is, as to whether the man in general practice should practice orthodontia, surgery, etc. Unless we meet that demand for service some one must, perhaps the general practitioner. I must say that we are doing no corrective work. I do not know whether that is a sound procedure. At present, we are concentrating on the development of the diagnostic ability by the student. With respect to correction by the general practitioner, we cannot ignore the subject. We must face it as it is presented to the medical profession and to the dental profession. The program which Dr. Black has suggested is that we have students handle orthodontic cases; that we place the instruction in orthodontia approximately upon the same plane as other subjects. I do not know whether that can be done. We are open minded about the necessity of preparing the students for this work. At the present time, it is my opinion that our more proficient orthodontists today would never be satisfied with this place. The men who have brought this specialty to where it is today, will never be satisfied with any training that we can offer in a general school. They have brought the practice of orthodontia to such a state of proficiency that only a graduate student can practice it satisfactorily. Of the two major subjects for specialization in dentistry, orthodontia is the one which could well be omitted from the general curriculum, and it is on that basis that we are proceeding. If preventive dentistry is preached in other states as it has been preached by the health department of the state of Michigan, we cannot always ignore the pressure. Someone will always be saying, "We are in need of more orthodontists than we are producing at the present time." We are asking this question, "Would you be satisfied to send these boys out and let them practice orthodontia?" No—you would require that it be done in the way it should be done. To quote: "For the practitioner who intends to specialize, no course of less than one school year is recommended as that is believed to be the minimum that should be devoted to this special training." That statement in itself nearly offsets the previous statement that a student should be trained to practice orthodontia. I agree that the average person ought to have a year of training, and a general practitioner who has had experience in meeting patients and has a knowledge of the whole field is a far more mature student than any senior that any of us can turn out. If we add one year to his training, he comes nearer to measuring up to what the best orthodontists today demand in the preparation of those who are to practice orthodontia.

Guy S. Millberry, San Francisco, Calif.: The time has passed for us to talk about orthodontic education; the time has arrived for us to do something about it. This has been a subject of controversy for at least ten years in the dental schools, and it is interesting today to see that there are probably more deans attending this section than any other. We have been thinking about this problem for some time. We have offered graduate instruction, on a one-year basis, a two-year basis for half time, for the past six years, and we have not been satisfied with the one year of instruction plan. We cannot train a man adequately in one year, especially in the clinical phases of orthodontic practice, either in the year immediately following his graduation or after he has been in practice for ten or fifteen years. One reason that many general practitioners wish to go into orthodontic practice is that it is a more lucrative field. The most important thing in dentistry today, as far as training is concerned, and the most neglected phase of our problem in dental education, is orthodontic education. It is important because it deals with children, and they are the ones who suffer by reason of insufficient preparation of the practitioner. That, in my opinion, is the outstanding problem before us. We have tried to solve it in this respect: In our curriculum in California at the present time, one third of the total number of 1,400 hours of instruction a year is devoted to operative dentistry, and one third to prosthesis. The remaining third is devoted to ancillary subjects and medical sciences. In the schools of America today, the maximum number of hours of instruction in orthodontics in five or six years of the training is about 366. Some schools are giving thirty-six hours of instruction in orthodontics in a similar period of training. Yet just as soon as the student gets a license to practice dentistry, he can engage in the practice of orthodontia on the basis of only thirty, forty or fifty hours of training during six years' time. I don't believe that he can even diagnose a case; and yet he is authorized to treat it. The amount of time devoted to training in crown and bridge and plate denture prosthesis has been increased at the expense of that devoted to orthodontia and oral surgery, almost excluding them from the undergraduate curriculum. Therefore, beginning with August of this year, we propose to offer an optional course wherein the student can take all of his operative dentistry, all of his medical sciences and ancillary subjects and orthodontics, in lieu of plate, denture and crown and bridge work. A man trained in this curriculum will be especially fitted to meet the needs of a small-town practice, qualified in the field of operative dentistry, to do all of the operative work for the children and the younger members of the family. When it comes to extracting the teeth of the grandmother, or making the dentures for the grandfather, he can refer that work to a dentist who is prepared to do it, perhaps a man in a larger community. One of the problems of orthodontic work today is the lack of opportunity for children in rural districts to secure necessary orthodontic service. The statement has been made by Dr. Black, and confirmed by Dr. Ward, that one year of instruction is the most satisfactory solution of this problem. I doubt it. I maintain that there is nothing more remote from the practice of orthodontics than full denture work as this specialty is taught today. What value is a course in full denture prosthesis to a man who expects to practice orthodontia? Why should a student go through four years of college training, getting all the technic in denture prosthesis and then engage in practice in orthodontia? It is an absolute waste of time, and it adds to the cost of his education. It adds to the cost of his service; and if we are to do something for humanity in the future, we should not waste this time. In adopting the previously mentioned program, what shall we include in it? Instead of giving prosthetic technic, we offer more biology, more physics or mechanics, either of which is applicable. In the second year, we propose to introduce orthodontic technic during the time equivalent to that spent in crown and bridge and denture technic and, in addition to this, some instruction in roentgenology, photography, biometry and anthropometry. The student in orthodontics will have an opportunity to get his first contact with the patient in doing mouth hygiene and prophylactic work during the second year and thus become acquainted with the problems of the dental chair. In the third year, he will begin to take, during the first semester, a limited number of simple cases in orthodontic practice and will give more time to orthodontic technic. In the second half of that year, he will reverse the order and take more clinical cases and devote less time to technic. In addition, he will have a course in rhinology

and laryngology. In the fourth year, when he has had virtually two years of training and experience, he will devote one third or more of his time to orthodontic practice and approximately the same amount of time or perhaps more to the work of the operative department, doing the same work as those students following the course in general dentistry. In a general way, this is the program we propose to offer as an optional one. Our faculty has accepted it as one of the possible solutions of this problem. What advantage is there in training an orthodontist to do reconstruction work in broken down mouths, in people of 45 or 50 years of age? What advantage is such instruction to the man engaged in the problem of taking care of children and in preventing dentofacial deformities? There is insufficient time in the four-year curriculum for us to teach all that we should teach in all divisions of dental practice. We will stand or fall on the success of this movement, since this is the way we feel about dental education in general. The plan may or may not be satisfactory. We believe it is worthy of a trial. Few orthodontists in general practice know anything about orthodontic curriculums. If a person knows nothing about the matter or plans of training, he is not in any position to say whether we should or should not do this or that, until he has investigated the subject. As far as the law is concerned, there has been a great deal of discussion on the matter. Some have said that a man must be a general practitioner before he takes up orthodontic work. The question of license has been raised, and it is said that a man should not be permitted to engage in practice in a specialty unless he has a general license. There is nothing socially or legally wrong in establishing a limited or modified license in dental practice and authorizing a man who is trained in operative dentistry and orthodontia to practice in those fields.

William Fisher, New York City: There is one point Dr. Millberry did not bring out, but which was brought out for the first time in presenting this plan: If a man, after taking this course and being licensed to practice, finds that he must go into general practice, he can return to any high grade institution today and, in about six months, with the knowledge that he has acquired in orthodontics learn the technic required for prosthetic work.

Dr. Millberry: A year of graduate instruction in crown and bridge or plate denture work can be offered to a man who is engaged in operative dentistry and orthodontic practice, just as the general practitioner now returns to a school for training in orthodontia at the present time.

Dr. Fisher: And he would be a better crown and bridge man and plate man than he could possibly hope to be by taking general dentistry. There is one other point. Up-to-date workable instruments meet another great need, and the student will be trained particularly to practice children's dentistry, and, in going into the rural communities, he can practice children's dentistry, and from that point build up an excellent practice in orthodontics. If the time comes when he wishes to give up general dentistry, he will drop his operative dentistry perhaps first, and continue his work with children; and it is in that field that this plan will also be of untold benefit.

John A. Lentz, Phoenix, Ariz.: I am not an orthodontist, but during my past thirty years' practice in Phoenix I have been forced to handle some orthodontic cases, because, until recently, there were no specially trained local orthodontists to whom patients could be referred. On account of the pitiful amount of training along this line received at school and the inadequacy of unsystematic "catch-as-catch-can" knowledge acquired later, the results necessarily were not all of the highest order. At that, they were no worse than the results obtained then and being obtained today by many legalized but improperly trained practitioners in orthodontia as distinguished from the highly trained orthodontic specialist of the present. We have heard discussions for many years as to what is wrong with the training in orthodontia, but nothing was being done. As far as Arizona is concerned, we decided to settle the matter, not finally, of course, because all movements like this must have a beginning and a growth, with the end far in the future. Therefore, anxious to wash our hands of further responsibility for the orthodontic shortcomings of general practitioners, we passed a law requiring a special examination for an orthodontic license. Our legislative committee is working on improvements in this law and are seeking information. Dr. Millberry has suggested something that I had not thought of. I cannot quite agree with him

at this time, but he is moving in the right direction. Under the present Arizona law, a general dental license acquired since the law went into effect does not grant the right to practice orthodontia, a special license being required. On the other hand, a competent orthodontist capable of passing the examination in orthodontia may secure a license without being forced to take an examination in general dentistry, which he might be unable to pass. Some of you will say, "You are going to be short of orthodontists in the small towns." Let me say that every dentist licensed before the new law became effective (there are from about seventy-five to 100 of such) may have issued to him a license to practice orthodontia by applying before a certain date. This is done because we could not legally circumscribe his former rights. If authorizing a man to practice orthodontia makes him an orthodontist, as many apparently believe, we should have a sufficiency of them in the small towns, and certainly we are going to have more real orthodontists. In Arizona until a year ago, and elsewhere at the present time, even a highly trained orthodontist was excluded from practicing orthodontia or dentistry in any form unless he could pass a general examination which stressed everything but orthodontia, the one thing he was qualified to practice. Is this just to the orthodontist or to those needing his services? Or is it just to our children that a state board, under the guise of a general dental license, should certify as a competent orthodontist a graduate whose own alma mater does not pretend to have given him adequate training in orthodontia? He can learn, of course, in four or five years, and we are prefectly willing, because we cannot prevent it, that he shall experiment in other states under his general license. If he can show that he has practiced orthodontia for five years, Arizona will at least examine him in orthodontia for a license to practice that specialty, and that is more than other states will do. The combination of operative dentistry with orthodontia, as suggested by Dr. Millberry, is perhaps a feasible thing.

Hugh Tanzy, Kansas City, Mo.: I am speaking today as an instructor, and not as an orthodontist. I have been attempting to teach the undergraduate students for more than seventeen years, and the graduate students for more than fifteen years, and I have been trying to practice orthodontia for over thirty years. I agree with Dr. Black that we should begin to give the student some instruction in the sophomore year, increasing it in the junior year and in the senior year, without any idea of turning him out a professional orthodontist. I would not expect to do that with a year's work after he had graduated in any dental college. I also agree with Dr. Black that the junior should be assigned a patient—that is, the patient should be assigned an instructor who is qualified to handle that patient, and the junior should be associated with him, having the opportunity to follow that case for at least a year.

About inefficiency: We have geniuses in every line of endeavor that have no training—that do not have to have. There are some men who would not become expert in a year or five years or fifteen years. We should eliminate the idea of turning out expert oral surgeon, or any other kind of surgeon, lawyer, preacher, orthodontist or dentist, after a five years' general course. Postgraduate teaching should be limited to the graduate school. Dr. Millberry made one statement that I think is entirely wrong, and all orthodontists will object to it, and that is that orthodontia is more profitable than general practice.

H. C. Miller, Portland, Ore.: It has been my observation and experience that there are few students entering our dental schools who are prepared, at the time they enter, to decide on any specialty. The safest plan is to lay a broad foundation. After graduation, when they find themselves and come to have vision, they can proceed along such lines as will make them specialists.

EXODONTIA FOR THE GENERAL PRACTITIONER*

By STERLING V. MEAD, D.D.S., Washington, D. C.

THE general practitioner, if he is to extract teeth, should prepare himself to give service along the line of that rendered by the specialist. While necessarily the services rendered may not be so efficient in every case as that of the man who is specializing in this branch, still the general practitioner must be governed by special procedures and give satisfactory service or refer the patient to some one who can give such service.

The outstanding factor in surgery of the mouth is correct diagnosis. There can be but one true diagnosis, but there are many ways of treating or operating in a particular case if the correct diagnosis has been made. The problem of diagnosis requires a knowledge of the various diagnostic factors, together with the cooperation of the physician.

PREOPERATIVE TREATMENT

Whenever possible, in any type of mouth surgery, the patient should be prepared by taking orange juice or tomato juice in sufficient quantities to prevent acidosis. From 25 to 30 ounces a day for two or three days should be taken before the operation. For ordinary operations, it is most satisfactory to have the patient forego the previous meal. A glass of orange juice may be taken three hours or more before the operation, if the patient wishes. Thus, the patient is prepared for any type of anesthesia.

It would be well for every dentist to adopt a routine plan regarding preoperative and postoperative roentgenograms. This can be done in every practice, as the cost of the roentgenograms may be included in the charges for the work done. There are many reasons that preoperative roentgenograms should be taken:

1. Whenever there is a question as to the postoperative result in relation to the preoperative condition of the mouth, the roentgenogram is of great value.

2. The preoperative roentgenograms will aid in deciding the diagnosis in those cases in which the postoperative roentgenogram shows a doubtful root area or sclerosis.

3. The preoperative roentgenogram will determine whether adjoining teeth are involved in a pathologic condition.

4. The extent of the pathologic areas and the involvement of adjoining areas will be determined by the preoperative roentgenograms.

5. That removal of a tooth has not sufficed to eliminate a pathologic area and therefore surgical operation is necessary can be determined in many cases by the preoperative roentgenogram.

6. The preoperative roentgenogram aids the operator materially in determining the type of extraction or the amount of difficulty he will experience in any particular operation, and enables

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the operator to prepare the patient for what is to be done.

7. The patient is better satisfied and will cooperate more fully in an economic way in postoperative treatments when conditions are explained to him before the operation. The preoperative roentgenogram tends to give the patient more confidence in the operator.

It is in the preoperative stage that measures can be taken to assure a successful operation and a good postoperative result. A postoperative complication of any nature is, under any circumstances, very discouraging. In the presence of acute infection, it is usually unwise to operate until some attempt has been made to control the infection. While it may be necessary or advisable to remove a tooth in the presence of acute infection or swelling, as the removal of the tooth may be the best means of drainage, it is not the method of choice. In the presence of acute infection, it is best to defer the removal of teeth, if there is liable to be traumatism or if surgical removal is necessary. In such operations as the surgical removal of impacted teeth, it is usually not a question of emergency, and removal is best delayed until the acute condition has been controlled.

The necessary prophylactic work should be done in the mouth before operations, in cases that require it. In some cases, subgingival treatment is necessary.

Before the removal of teeth, I prefer to wipe the field with a piece of sterile gauze. If local anesthesia is used, I prefer to paint the tissues with an anodyne solution such as the following: benzyl alcohol; ethyl aminobenzoate; metaphen or a solution of benzyl alcohol, ethyl aminobenzoate, resorcinol.

When using procain, I prefer a small amount of epinephrin, using the minimum amount required. The alarming effect of the drug may be eliminated by placing the patient in a reclining position and by giving from 15 to 20 drops of spirits of ammonia from one-half to one minute before the injection. Preoperative medication is usually not necessary. I do not advocate giving drugs by mouth, as the action of these drugs varies with different patients and the procedure is very unreliable. If there is likely to be prolonged work or the work is more difficult and the patient would be subjected to shock, I prefer one-sixth grain of morphin sulphate or one-third grain of pantopon, one hour before operation and repeated in thirty minutes. When it is necessary to correct the bleeding or clotting time, I prefer to cooperate with the physician, and I usually place the patient on a four-day preoperative program of eating plenty of gelatin with each meal, using from 30 to 40 grains or more of calcium lactate a day, drinking plenty of orange juice and using coagulin intramuscularly each day. Actinic ray light treatment may be used, beginning with three minutes at 18 inches.

In preparing for the removal of third molars, it is well to examine not only the mandibular but also the maxillary third molars to be sure that they are not elongated or pressing against the tissues. The throat should be carefully examined for inflammation and diseased tonsils. If teeth bordering the maxillary sinus are to be removed, the sinus should be carefully considered, and any involvement of the sinus should be ascertained if possible.

An attempt to remove a tooth without first making the necessary roentgenogram and studying the case may lead to disaster. The lingual intra-oral view is usually the most important. In case an impacted tooth is far from its normal position, an extra-oral view may be necessary. If the

tooth is covered by an osseous structure, the occlusal intra-oral view is also advisable, to show the buccolingual relationship of the tooth.

OPERATIVE PROCEDURES

Before attempting any type of mouth surgery, it is well to make a careful diagnosis and study of the case. Procedures will vary for different cases and different patients. Whenever teeth can be removed by simple extraction, this is the method of choice. If the extraction is complicated or there is a pathologic area that cannot be handled through the tooth socket, without visualization of the field of operation, an open-window operation should be done. The incisions necessary for different cases or different types of mouths will vary greatly. In order to determine how to make the incision, it is necessary to take into consideration the amount of structure it will be necessary to expose and the access necessary for the particular work. It is well to consider the necessity of having a ridge of bone upon which to place the flap after the operation, and to see that the incision does not fall in the line of muscle attachment. During the removal of teeth, it is well to have the mouth blocked off as well as possible with gauze, and to keep the wound clean of saliva and blood by the use of an aspirator and gauze. Difficult operations, such as the removal of impacted teeth, should be performed during the early part of the day so that, during the day, the necessary postoperative work to prevent hemorrhage, pain, etc., may be done.

IMMEDIATE POSTOPERATIVE CARE

Immediately after the removal of a tooth, the wound should, if necessary, be sutured to keep the parts in proper position. This suture should not be drawn too tightly. A piece of gauze should be laid over the top of the wound and the patient instructed to close the mouth gently upon this until a blood clot occurs. A mouth wash is not to be used for three or four hours, or until clotting has occurred. After the removal of impacted teeth or an operation in which there is traumatism, an ice bag or ice-cold cloths should be immediately applied to the face and the patient allowed to rest. After a few hours, the patient is again seen, and if the sutures are drawn too tight or if the tissue is beginning to swell, the sutures may be loosened or a drop or two of congested blood may be let out between the tissues and the congestion relieved. If the blood clot is not forming, a gauze wick may be placed in the wound.

POSTOPERATIVE ROENTGENOGRAMS

Those who have had a wide experience in the removal of teeth and have given proper attention to postoperative conditions and results appreciate fully the value of the postoperative roentgenogram. The roentgenogram made immediately after the operation is of the greatest importance. It shows whether all of the tooth and root have been removed, whether pathologic conditions have been eliminated. I have used the postoperative roentgenogram as a routine procedure for many years, and I feel that it is absolutely necessary. My plan for providing postoperative roentgenographic service is as follows:

Immediately after the removal of a tooth, if there is doubt at the time as to whether the roots have been removed, the patient is sent immediately to the x-ray room, and a roentgenogram is made and developed while the patient waits. If there is nothing unusual in the case and the operator feels assured that everything is all right, the patient is put in a rest

room, and when the bleeding stops and the patient is ready to leave the office, he is sent to the x-ray room and a roentgenogram is made. This is put into a small 1 by 3 envelope and marked with the patient's name and sent to the developing room. The picture is developed during the day at the convenience of the x-ray technician. In the evening, all of these postoperative roentgenograms are sent to the operating floor and are placed in alphabetical order, so that when the patient returns on the following day for treatment, these small envelopes can be attached to the case record and sent to the operating room. The wound is then examined; the postoperative roentgenogram is examined, and the result is noted on the record. In case the patient fails to return the day following the removal of the tooth, on the evening of this second day the postoperative roentgenograms remaining over are checked up, and if anything wrong is indicated, the patient is requested to return to the office. Following are the advantages of the postoperative roentgenogram:

1. It may be used immediately after the extraction, to determine whether there are any foreign materials or bodies, loose particles of bone, sharp processes, roots, etc., remaining.

2. It allows the operator to visualize the extent of the pathologic area in the bone and the extent of damage to the remaining teeth and surrounding processes.

3. When the patient returns complaining of pain, it is a great source of comfort to him to be shown a postoperative roentgenogram indicating that the case has been handled successfully, and he becomes more amenable to suggestion and proper treatment.

4. In some cases, the postoperative roentgenogram will call the operator's attention to some pathologic condition that he failed to notice in the preoperative roentgenogram, as the pathologic condition may stand out more prominently in the postoperative roentgenogram, after the removal of a tooth.

5. In some cases, a supernumerary nodule or root from a deciduous tooth or in a space occupied by some other tooth previously removed, which has been hidden by the tooth that was removed, will be revealed in the postoperative roentgenogram. If no postoperative roentgenogram were taken, the patient might eventually find out in some other way that this root was present and feel that the operator, in removing the tooth in question had left a piece of the root; whereas, it might be a root from some previous extraction.

6. The postoperative roentgenogram is of great value in following the healing process if viewed at different intervals after the removal of a tooth.

7. The legal value of the postoperative roentgenogram is of the greatest importance. If any question arises regarding the operation and the patient threatens legal procedure, the operator is at a great disadvantage if he does not have a postoperative roentgenogram to strengthen his case.

8. The postoperative roentgenogram is definite evidence to the patient that the operator has made every effort to check his work and is thorough in his procedure. The patient appreciates this service and more willingly cooperates during postoperative treatment, and, when dismissed, he is satisfied that his mouth is free from residual infection.

POSTOPERATIVE TREATMENT

Postoperative treatment is an important phase of this work. No matter how skilfully an operation is performed, it may be a failure from the patient's point

of view in the absence of postoperative treatment. It is important to see that the tooth is removed in its entirety; that all pathologic tissue is removed, and that the wound heals properly. It should be routine procedure to see all cases postoperatively, and the unusual and complicated cases should be kept under close observation. In the case of an uncomplicated extraction, the patient should be kept in the office until the blood has clotted and until all pain has disappeared. He should be given definite instructions regarding care of the mouth and told to return for treatment. I find that it is a good plan to have a printed chart of instructions similar to the following:

Follow instructions given you.

If you have profuse bleeding or any sign of bleeding after one hour, you should return immediately for treatment or telephone the office before 5:15.

If you have pain, you should return or telephone office before 5:15, as this can be controlled.

You should return the day after your extraction or operation for treatment, and each day thereafter until you are dismissed as cured.

If after being dismissed you notice anything wrong, you should telephone or return immediately for examination.

Your attention is called to the advisability of preoperative routine full mouth roentgenograms (x-rays), immediately postoperative roentgenograms and a further roentgenographic check-up within six months.

Office hours: 9 to 1 and 2 to 5:15 daily; Saturday, 9 to 1. Sundays and holidays, 9:30 to 10 a. m., by special appointment.

Office address:

Office phone:

In case of pain or bleeding, or if house call is desired, telephone the office.

I advocate the use of a rubber stamp with the words "Instruction slip received," and this is stamped on the back of the patient's record. When the patient goes to the secretary after receiving definite instructions from the nurse and the doctor as to the exact care of the wound and the mouth, the secretary has him sign for the instruction slip. The purpose of this is to give the operator assurance that there will be no misunderstanding regarding the patient's returning to the office. There is a great deal of legal assurance found in this method. A great many patients will fail to return, and, in case they have trouble, will always say that they were not instructed to return. With this method, the patient can always be convinced that it is his fault if he does not return or call the office. This is an important consideration.

DISCUSSION

M. Hillel Feldman, New York City: There is nothing which the general practitioner can apply to his daily practice with greater benefit to himself and to his patient than to give the attention to a case postoperatively which that case requires. I know that it is a custom of the general practitioner to leave the chair as soon as he sees the tooth completely encased in the forceps, but there is much to consider in connection with this wound which a general practitioner is liable to overlook. The attention which Dr. Mead advocates will eliminate postoperative complications, spreading of the buccal plate, dropping back into the apex of the alveolus of fragments of bone, enamel or amalgam fillings which may be in the crown of the tooth before the application of the forceps, etc. There was one point with reference to the words "surgical removal" which should be emphasized in order that there be no misunderstanding in the mind of the laity. This is with especial significance to the general practitioner. We hear the words "surgical removal" of teeth. I believe all teeth are surgically removed when they are removed from the mouth, whether forceps are used or a flap is made preliminary to the application of the forceps, or preliminary to the application of a drill or a chisel to remove obstructing bone. The term which should be used in order that the laity shall not feel that, when the tooth has been removed with forceps, there has been no surgical removal, in the case of the forceps extraction is the word "simple," and when a flap has been made and the mucoperiosteal tissues dissected.

the term "involved" or "open view" method should be used. That, I feel, is of especial significance in the general practice. Another point which ought to be emphasized with reference to the preoperative procedure from the standpoint of the general practitioner is the handling of the mandibular third molars, partly impacted, or otherwise.

George Schneider, La Salle, Ill.: While I was listening to Dr. Mead's paper, I wondered how many practitioners there are here in the Mississippi Valley who can use his technic 100 per cent. I appreciate this paper because it applies to the general practitioner. There are more teeth removed by the general practitioner than by the specialist. According to Dr. Gardner, one patient out of every three who calls for an extraction has one or more roots left in the mouth. When it comes to the surgical removal of teeth, I apply some surgical methods to the removal of every tooth for the simple reason that it is neither surgery nor modern dentistry to tear soft tissue, and if we do not first remove the soft tissue from the neck of a tooth, we tear it. It is neither surgery nor modern dentistry to fracture or break hard tissue; therefore, all hard tissue that is liable to fracture should first be removed. I have six cardinal points that I follow: 1. Study the line of the least resistance to the tooth. 2. Remove as much of that resistance as is compatible to the adjacent tissue. 3. Reserve and preserve the mucoperiosteum while removing the alveolar process. 4. Remove the tooth along the line of the least remaining resistance. 5. Protect the tooth socket from all mouth excretions until it has filled with normal blood tissue. Whatever is placed in that socket afterwards will have to be removed and replaced by normal blood tissue. 6. Never apply enough physical force to a tooth to fracture it, the adjacent alveolar process or the jaw. In other words, if we wish to become perfect in the removal of teeth, we should have the delicacy of touch of an artist, to know when to let go of a tooth before it fractures.

Arthur V. Barber, Ogden, Utah: Dr. Mead says that he does not use any wash at all after extraction. I merely want to ask him if he believes in filling the socket with a surgical dressing, especially in case of what we call dry socket.

M. R. Howard, Denver, Colo.: I wish to emphasize the importance of preoperative and postoperative roentgenograms. In one of my cases, a lower right cuspid was apparently removed in its entirety, the apices showing unbroken, but the roentgenogram taken postoperatively revealed a small residual root, and a check-up with the film taken before extraction showed a tiny root superimposed on the larger root. An endeavor to eliminate an infection in such a case would fail if the supernumerary root went undiscovered. In another case, a little piece of metal from an amalgam filling had dropped unobserved into a socket. If we wish to elevate the art of tooth removal, the use of the roentgenogram before and after operation is one definite way of so doing. When a troublesome case is referred by the country practitioner to the nearby specialist, it is no reflection on the former if the use of the roentgen-ray film reveals a residual root. In cases of this kind, I find that perfect honesty with the patient is met with appreciation.

B. H. Johnson, Nashville, Tenn.: If he takes the suggestions given here, and takes postgraduate courses whenever he has an opportunity, the general practitioner can handle the ordinary cases and handle them as scientifically as the specialists. General practitioners should be as able to handle the ordinary cases, and if we do not feel that we are so able, and do not take the precaution to make thorough examinations and diagnose cases carefully, we should not extract teeth. What we believe a simple operation may turn out to be very difficult before we are through.

THE DECIDUOUS MOLARS—NATURE'S SPACE RETAINERS*

By JOHN E. GURLEY, D.D.S., F.A.C.D., San Francisco, Calif.

IN a symposium held recently before the New York Academy of Dentistry, in which Russell L. Cecil, M.D., and LeRoy M. S. Miner, M.D., D.D.S., were the speakers, Dr. Cecil[1] spoke as follows:

> In respect to pediatrics, we are concerned chiefly with preventive dentistry. Perhaps the most important phase of this problem is the determination of adequate vitamin supply in the child's diet. Next in importance I would place orthodontia. The orthodontist has come to pay an active part in the lives of children with "crooked" teeth. Whether these irregularities are hereditary, nutritional or mechanical, they must be corrected as far as possible, not only for esthetic reasons, but also for the better preservation of the teeth themselves.

I come before you with a plea for the retention of the deciduous molars until the proper time for replacement shall have come, and with the suggestion that proper consideration of these teeth as space retainers will carry us far into the field of "preventive orthodontia."

As long ago as 1920, Charles R. Baker[2] made an exhaustive study along this same line and presented the results of his findings. He made many suggestions of real value to both the dentist and the orthodontist.

It is my desire to speak to you more particularly from the standpoint of the dentist, and to bring to you a few of the observations which I have been able to make in a period of several years' work with children. My remarks must be rather general, for I am not an orthodontist, nor do I wish to consider the subject from the standpoint of the orthodontist; neither do I wish to be too technical from the standpoint of the dentist, for that is beyond the pale of your interests. Therefore my first object in presenting this paper to you is clearly indicated, namely, the determination of some common ground on which we can meet and in which we are interested. You are interested in normal jaw development and the maintenance of the teeth in their proper positions. I am interested in the care of teeth, and their maintenance in the jaws. Both of us are interested from the health standpoint of our patients. And so, with Dr. Cecil, quoted above, we are all interested in prevention. Am I, then, far wrong, if I suggest to you the fact that we are all interested in saving the deciduous teeth? Nature put them there and surely not without a reason. Nature gave them a certain size, and must this not be correct? To overlook for the moment the functions of mastication and enunciation, are they not "Nature's space retainers"?

I am so firmly convinced of the importance of this "common ground" on

*Read before the Section on Orthodontia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 23, 1930.

1. Cecil, R. L.: J. Dent. Res., 10:133 (April) 1930.

2. Baker, C. R.: Exchange of Deciduous for Permanent Teeth, J. A. D. A., 7:753 (Sept.) 1920.

which you and I meet that I have come to feel that the real field of each of us is a combination of the two and that the specialist of the future, be he orthodontist or pedodontist, will combine both in his practice. Incidentally, some of the leading orthodontists have so expressed themselves to me.

Referring again to Dr. Baker's thesis and one of his illustrations, which I am using (Fig. 1.), you will note the average widths of the different teeth, the total of which would, of course, make up the lineal tooth surface around the arch. (These averages are taken from G. V. Black.) I wish to confine our attention to the deciduous molars and their successors, the bicuspids, exclusively. You will note that the bicuspids measure 7.2 and 6.8 mm., respectively, in the upper jaw, and 6.9 and 7.1 mm. in the lower. The deciduous molars measure, respectively, 7.3 and 8.2 mm. in the upper and 7.7 and 9.9 mm. in the lower jaw. The deciduous molars are considerably wider mesiodistally than the bicuspids.

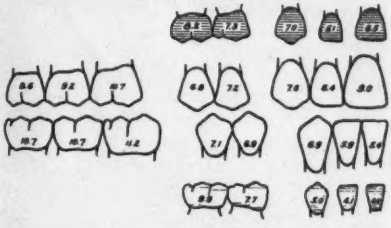

Fig. 1.—Relative mesiodistal widths of the deciduous and permanent teeth, the size of the average tooth being indicated in millimeters. (Black.)

This fact is of great importance. Nature made it so, and it is not ours to alter nor allow to be altered. The molars are wider in order that, when their functional requirements are fulfilled, growth and developmental changes may logically follow. Miner[3] says: "One of the reasons that dentistry has not progressed as it should is the fact that it has had no underlying fundamental philosophy." Here, then, is an opportunity for us to develop such a philosophy. Should these molars have been narrower or of the same width, they would have been so arranged. But they are wider. On each side of them erupt the permanent molars, which are very large, and the permanent anterior teeth, which also are much wider than their deciduous predecessors. In the expansion and enlargement of the arches, the latter teeth shift into their places on each side of the deciduous molars, and finally they are replaced by the narrower bicuspids, so that a final adjustment into position may be made.

Fig. 2.—Normal case; the only condition which may provide a normal occlusion without subsequent mechanical interference on part of orthodontist.

If one or more of these be lost, a guiding influence is gone and irregularity ensues. It may be only slight or it may be great, but it is at least a beginning. (The normal transfer or exchange of deciduous and permanent teeth consists of a shedding of the former and eruption of the latter. This is not a loss of a decidu-

3. Footnote 1.

ous tooth, nor is it a premature loss if the tooth comes out before its time—it is then a loss. There is no such thing as "premature loss"—it is just "loss.") In case of loss of a deciduous tooth, retainer bars may be applied, but as far as I have been able to determine nothing short of a complete appliance for that arch is satisfactory. A loose end arrangement will not hold, and if the bar is anchored at both ends, normal bone growth and expansion are interfered with.

Figure 2 shows a normal case, the condition which we should make every effort to maintain, and the only condition, as I view it, which stands a chance of providing a normal occlusion without subsequent mechanical interference on the part of the orthodontist.

Fig. 3.—Same condition as shown in Figure 2.

Figure 3 shows the same condition. Figure 4 shows a reparative effort—an abscess treated, the root canals filled, the filling placed and contact restored, and thus the tooth retained in its place to perform its normal functions, both in mastication and as a space retainer. Figure 5 shows the same condition with two approximating fillings. One of the teeth had had an abscess when first seen.

Figure 6 shows a lower second deciduous molar which had been treated for infection, the root canals being filled three years prior to the taking of this picture. You will notice the definite service it has rendered in holding the space between the first molar and first deciduous molar, including the fact that root resorption has progressed satisfactorily; in fact, about normally.

Figure 7 shows the same condition in the upper jaw, and here the filling has likewise seen three years of service.

Figure 8 shows the right and left views of the same case, the deciduous molars, treated and filled and contacts established.

Fig. 4.—Reparative effort—abscess treated, root canals filled, filling placed and contact restored, and the tooth thus retained in its place to perform its normal functions.

Figures 9 and 10, showing each side of the same case, indicate a very common result of loss of the deciduous teeth, the distances between the cuspid and first permanent molar being 12.15 mm., as against the average of 15.5 mm. for the deciduous molars and 14 mm. for the bicuspids. Here is an orthodontic case made by man.

In Figure 11, the child is 5 years old. What will be the result from the standpoint both of orthodontia and of function

in mastication? The little piece was made to wear for a while.

I hope to persuade you as to the necessity of retaining the deciduous molars until the time for shedding has arrived; that abscesses may be successfully treated and the canals filled; that root absorption progresses about normally, and that the deciduous molars may be successfully handled from the standpoint of dental treatment.

Dr. Miner, referring to the matter of progress especially as it applies to the practice of dentistry, quotes a definition of the word "progress" by Robert A. Millikan, as follows: "Progress is an increasing control over environment." Then Dr. Miner asks, "Has dentistry progressed in this sense?" and answers in the negative, in part as follows: "There has been no fundamental philosophy underlying dentistry—we don't know where we're going, but we're on our way"; and continues, in substance, "There is an apathy on the part of medical men toward dental matters and the traditional prejudice between dentistry and medicine, they having had very little in common, because of the mechanics involved in dentistry, and which has been its chief objective."

Fig. 5.—Condition shown in Figure 4, with two approximating fillings. One of the teeth had had an abscess when first seen.

Here is a challenge to the dental profession, including all of its specialties. We must be skilful, of course, but our mechanical skill must be backed by scientific knowledge.

I think that we are now past the point of "not knowing where we're going," and that we are headed in a definite direction, toward a definite goal. Our dental undergraduate curriculum has been changed, so that the new student is scientifically trained before he begins his study of dentistry; in our associations, we are rapidly moving toward strictly professional and scientific instruction of our members by our confrères, as opposed to that offered to us by commercial institutions whose chief aim is to sell something; we are passing by the so-called itinerant instructor, whose teachings are mechanical and not backed by scientific proof,

Fig. 6.—Lower second deciduous molar which had been treated for infection, the root canals being filled three years prior to the taking of the picture. The tooth has rendered definite service in holding the space between the first molar and the first deciduous molar. Root resorption has progressed about normally.

and we have shown a positive opposition to the undermining influence of those who would attempt to break up the profession of dentistry into a polyglot of smaller professions, between which correlation for the benefit of those whom we serve would be impossible. In other words, our desire is that we shall maintain the "unity of dentistry," that each of us may have better knowledge of the other's work and that the public may thereby receive better service at our hands.

Every specialty needs to know much within the domain of the other specialties, and this is not possible should we be separated in our study and our practice, as proposed by some of our members.

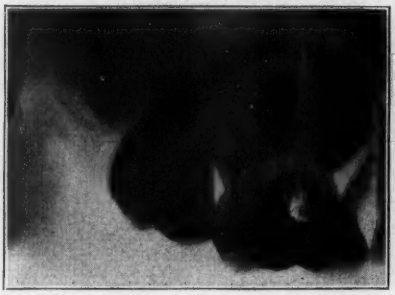

Fig. 7.—Condition shown in Figure 6; upper jaw.

Hence, my hope is that you may see more positively the service which the general practitioner or the children's dentist may render to you and your little patient, and that, from the discussion to follow, we dentists may obtain a greater insight into the value of that service.

We need to work more earnestly and unitedly toward a positive health service for our patients, and we need to further impress on the public the value of our service from a health standpoint. Only the other day, one of the most prominent men in my home city said, in discussing legislative questions, "I am willing to admit that the medical profession has a great and grave responsibility, even involving the question of life or death, but as far as the dentist is concerned, he may ruin my teeth, but that is all." There is a shade of truth in this, of course, as far as immediate life and death are concerned, but what about his health and the value of his teeth? The matter of his knowledge lies wholly within the hands of his dentist, whom he quoted as saying that a certain chain drug store, having now

Fig. 8.—Right and left views of case shown in Figure 7. The deciduous molars have been treated and filled and contacts established.

changed hands, no longer favored the physician or dentist in the matter of discounts.

Miner concludes his address as follows:

> . . . dentistry should replace the thought that its work is of second-rate importance with the conviction that it is doing a noble work for mankind. Dentistry should slough off its professional provincialisms, and step

out into the world of scientific endeavor. Then and then only will medicine and dentistry come together on terms of mutual respect. The ability to accomplish this rests with the achievements of dental education in the next ten years.

But the "dentistry" of which Dr. Miner speaks consists of the honest and undefiled effort that we as individuals shall put into it. Let us put off the "old man" and take on the "new."

350 Post Street.

DISCUSSION

Samuel J. Lewis, Detroit, Mich.: Dr. Gurley has made a statement the importance of which we are at this time unable to estimate when he suggests that a proper consideration of these teeth as space retainers will carry us far into the field of "preventive orthodontia." We hear much about preventive orthodontia *per se* but actually, except in a few well-defined conditions, it does not exist. I agree with Dr. Gurley that these deciduous molars are Nature's space retainers, and when one sees the aggravated conditions of malocclusion brought about by the loss of these teeth, the question arises, "Have we as dentists discharged our duty toward these patients?" Dr. Gurley is right: these are man-made cases of malocclusion, and those of us who are neglecting this most important service should bow our heads in shame. It is a sad commentary on dentistry that one has to come before a body of orthodontists and ask that we meet on some common ground to discuss a subject that is of such vital interest to all of us, be we orthodontists, pedodontists or any of the many "dontists" so prevalent today. Are we not all members of the dental profession, and are we not all interested in the same problem, the maintenance and the restoration of normal functional activity of the dental apparatus? In speaking of the purpose of dentistry, A. Leroy Johnson says: "The filling of a tooth, the treatment of an alveolar abscess, the construction of an artificial substitute or the modification of the supporting structures of the teeth by means of an orthodontic appliance, in fact each and every operation about, on or within the teeth is governed by the same purpose, i. e., to preserve and restore functional activity of the apparatus as a whole in the effort to enhance the adaptability of the entire organism to its environment." The truth of this statement cannot be doubted, and if you apply it to the preservation of the deciduous molars, you will not only preserve functional activity of the organism, but, as Dr. Gurley has said, you will also be practicing "preventive ortho-

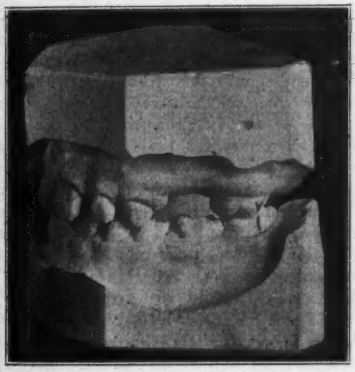

Fig. 9.—Case shown in Figures 7-8.

Fig. 10.—Case shown in Figures 7-9. In Figures 9-10, a very common result of loss of the deciduous teeth is seen, the distances between the cuspid and the first permanent molar being 12.15 mm., as against the average of 15.5 mm. for the deciduous molars and 14 mm. for the bicuspids; an orthodontic case made by man.

dontia." I realize that occasions may arise when the extraction of these teeth will be advisable, even before their normal shedding time, and I cannot agree with Dr. Gurley that when one or more is lost, a guiding influence is gone and irregularity ensues. This is not always true, as has been shown by our observations at the Merrill-Palmer School, where we are studying the growth of the dental apparatus on a group of preschool children. While, in the large majority of cases, irregularity ensues after the loss of these teeth, there are some that develop normally. It seems to us that the closure of the spaces is somewhat dependent on the position of the permanent tooth in its crypt, and the relations of the occlusal factors of the

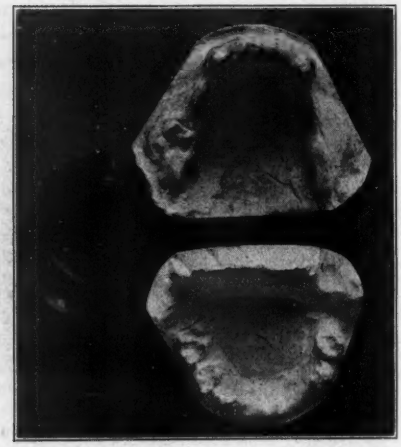

Fig. 11.—Models from the case of a child, aged 5.

remaining teeth. It is true that these spaces do get larger at times, and, in some cases, remain the same; yet I would not use this as an argument against preserving them by dental operations. In all cases, where there has been a loss of these teeth, accurate models should be made, and the case observed at regular intervals to determine whether any change is taking place. If there is a change and that change is one of closure, remedial measures should be instituted. Neither the loose end or fixed space retainer in my experience has been very successful. Since seeing the work of Dr. Willetts, of Peoria, Ill., on maintenance of spaces, I am more convinced than ever that nothing short of a complete appliance is satisfactory. He has used partial dentures in many cases, and the stimulation they produce by resting on the soft tissues seems to prevent the appearance of old age so often noted when both molars are lost. Eruption of the permanent teeth in many cases seems to be hastened when this type of appliance is used. There is one phase of this problem that Dr. Gurley has not mentioned, and that is the too long retention of the deciduous molars. Those of us who are treating malocclusion have been brought face to face with this problem many times. While there is a wide range of variation in the time for shedding these teeth, sometimes these teeth are retained so long that they interfere with normal developmental processes. Eliminating those cases, where there is a congenital absence of the permanent bicuspids, many times, on roentgenographic examination, we find that one root will be resorbed, and the other remain *in situ*. Again, we find that these teeth when retained too long will interfere with the anterior movement of the permanent molars, a movement which is necessary in the final adjustment of the dental arch. In many of these cases, we find a well-developed area of caries at the point of mesial contact of the permanent molars. What are we to do in these cases? Should we extract the teeth or should we wait for Nature to shed them? As our knowledge of developmental processes increases, we will be able to cope more successfully with these cases, and, among other things, this means that we must study more and more the problem of the shedding of the deciduous teeth and the eruption of the permanent ones. At the present time, we must use what Dr. Angle calls our sixth sense, common sense, in meeting this problem. Dr. Gurley showed us that good and conscientious dental work would do much to preserve the deciduous molars, and his illustrations prove that many conditions we have thought beyond remedy can be treated successfully. How welcome this work is to the orthodontist, who sees the end result of the havoc wrought by the loss of these teeth. The big problem, it seems to me, is yet with us, and that is how we are to prevent this condition. I was enthralled the other day when I read the report of the investigation by Martha Davis and her associates on the teeth of the pre-

school children in Hawaii. She found a positive correlation between diet and caries, and her work, in my opinion, will carry us far into the field of preventive dentistry. Be that as it may, we must consider what we can do at the present time to prevent rampant caries from attacking these deciduous teeth. During the past year, I have been making bite-wing roentgenograms of the posterior teeth of all my patients, and it is amazing the number of these teeth that have radiolucent spots as early as at 3 or 4 years of age. I am checking up a number of these once every three months to see how rapid disintegration of the enamel is. In others I am making a separation and painting the surfaces with 50 per cent silver nitrate, checking these with roentgenograms every six months. That early caries is recognizable in the deciduous teeth at the contact points by the use of bite-wing roentgenograms and in the pits and fissures by oral examination is an assured fact. A combination of early recognition of caries by means of the roentgenogram, the institution of proper remedial measures and a proper dietary régime, will do much to solve the problem, and the maintenance of Nature's space retainers as Dr. Gurley puts it, will be an assured fact.

H. D. Keeler, Des Moines, Iowa: I was surprised to note in a picture shown on the screen that the roots of these deciduous teeth in which the nerves had died and which had been filled, absorb just as did the roots of the deciduous teeth that were alive. I am a little skeptical yet as to whether they absorb normally with the rest of the roots, and I should think that they would have to be watched very closely and removed if necessary at the proper time.

Paul A. Barker, Denver, Colo.: Does Dr. Gurley feel that he can assume the responsibility which must necessarily rest on his shoulders in the maintenance of a tooth which is or has been abscessed, and which (while possibly having been treated and the root canal filled to a certain extent) remains a possible focus of infection? I have never been able to feel satisfied that we are not taking unnecessary chances with the health and possibly the very life of the child. If we admit (and I believe we all do) that our research men have proved that pulpless teeth are, in the majority of cases, a definite foci of infection in the mouth of an adult, is there any reason to believe that the same foci of infection in the mouth of a small child will not be more dangerous? In the case of the extraction of a single deciduous molar, Dr. Gurley, I believe, made the statement that a full arch appliance should be placed for space retention. Such has not been my experience. I am happy to learn of the experiences of other men in this matter, but I do not feel that the loss of a deciduous molar should call for the placement of a complete lingual or labial arch to maintain the necessary space for the erupting bicuspid tooth. It seems to me that it is hardly fair to the child to subject him to a full arch appliance when a small single tooth space retainer could be used. I was interested to learn that Dr. Gurley feels he has satisfactorily filled the root canals in these deciduous molars. I have not yet been able to do this to my satisfaction. I should like to hear more on the matter. Dr. Gurley made the statement that we must first of all render a health service to the child, but I fail to see where it would be rendering a health service to retain in his mouth a pulpless tooth with its ever-present danger of focal infection. There is one way and only one for the dental profession to settle this everlasting controversy on abscessed deciduous teeth and that is by rendering proper dental service to the very young child, placing the proper fillings in the small pits and fissures and thus preventing the death of pulps.

Hugh G. Tanzey, Kansas City, Mo.: As regards the natural space retainers, it is not always just the space that we want retained. An important consideration in connection with extracting temporary teeth early or losing them early from any cause is the fact that the gums get so that eruption of the permanent tooth is interfered with. I think the propaganda regarding prophylaxis, the condemnation of pulpless teeth and the placing of space retainers, has been overworked. I would rather have a pulpless temporary tooth left in the jaw for several years, even with no attempt to fill it, and I would rather have those broken down roots left in the gum, keeping the gum tender, than to have them out and a space retainer, not retaining sufficient space or providing for more, employed. In the presence of an abscessed temporary tooth, the roots are not very deep in the solid bone, and the pus finds an opening. I have never observed any serious trouble from this condition. These teeth are likely to exude pus about every six months. This goes from the

mouth to the stomach, is acted on by the acid secretion there and does little damage. As to the possibility of decay of the underlying permanent tooth, I have not seen decay of a permanent tooth under a broken down deciduous root. After practicing thirty years, I still hold that I would rather keep these teeth in the jaw than extract them three or four years too early, especially when eight or ten are taken out at one time.

A. H. Ketcham, Denver, Colo.: The greatest trouble is that a certain percentage of these patients will die.

Dr. Tanzy: I have not had one die.

Blaine Truesdell, Omaha, Nebr.: I have yet to see many space retainers or maintainers that did very much good, either my own or anyone else's. If a deciduous tooth or a permanent tooth is abscessed, or there is a lesion or focal infection, that patient would be better off without that source of infection, and my patients, if they follow my advice, have these teeth removed. If our patients will sleep on their backs, retainers become unnecessary. There are few places where space maintainers can be used to advantage, the only times, perhaps, being in the case of premature loss of a deciduous second molar. That space can be maintained and will be maintained without the space retainer, if the child will keep off the face. General and promiscuous use of space maintainers is of questionable value, to say the least.

Dr. Gurley: I should like to confine our thoughts to the point which I have attempted to make, namely, the relation between the widths of deciduous molars and of the bicuspids to follow. We see spaces already indicated by Nature, and this should be taken into consideration in anything which we do, and any mechanical device should, first of all, offer the least possible interference necessary. I necessarily speak concerning the possible loss of deciduous teeth. If there is no loss, we have no space to maintain, because it is already maintained. Therefore, I did not give any thought to the too-long retention of deciduous teeth, nor to the question of infected root canals, abscesses and their treatment, and the filling of canals. I am perfectly willing to accept the responsibility for the treatment of abscessed deciduous teeth. Of course, I will select my cases. There are some for whom I would recommend extraction, and there are some for whom I would recommend treatment. Blaney, Hatton, Marshall and scores of others tell us that teeth may be successfully treated. If I were a physician and had a patient with a gangrenous toe, I would not cut off the toe immediately. I would try to stop the infectious process, and if I was not successful, I would take off the toe. If that were not sufficient, I would take off the leg below the knee; and if that were not enough, I would take the leg off below the hip. If the condition persisted, we would have recourse to the elimination process. I would study the condition clinically, determine the general health condition and then decide on the treatment. As far as the separate roots are concerned, I would not retain them. I would not keep a root in the jaw, neither of a deciduous tooth nor of a permanent tooth, unless it could be sterilized and filled. If this cannot be accomplished, it should be removed. I do not want the bleeding, nor do I want the gum-boil, so called. In the treatment of a deciduous tooth, a few treatments will indicate whether the infection will respond. If it will not, the tooth should be extracted. It cannot be treated too long, because the other extreme of drug irritation must be considered. In the cases I have shown here, the teeth were treated. With regard to just one tooth's being lost, and the possible effect, I realize that the loss of one deciduous molar and, perhaps occasionally, four deciduous molars in the same jaw may not result in the shifting of the teeth so as to bring about malocclusion. But there are cases in which it does and we need to be on our guard. Nature's space retainers, the deciduous teeth, are the perfect ones. If one or more are lost, a careful study of the forces of occlusion may indicate the course to follow. Our judgment will tell us whether to apply a mechanical retainer or a full complement of orthodontia bands, or to let it alone.

THE SIGNIFICANCE OF GINGIVAL HEMORRHAGE*

By IRWIN A. EPSTEIN, D.D.S., St. Paul, Minn.

THE fact that numerous articles about hemorrhage are appearing in the dental literature reporting difficulties in its management is evidence that the subject is one of concern to the dentist. That bleeding of the gums is almost as frequently the reason for a visit to the dentist as is pain shows that the laity are beginning to regard it as a danger signal. Hemorrhages from the gum margins are noted in the hospital records of medical men as a fact of importance to them when they will commonly make no mention of an otherwise badly diseased mouth.

The blood vessels which are found in the gingivae terminate in capillary loops at the extremity of the connective tissue papillae which invaginate their epithelial covering. Although there seems to be some difference of opinion between research workers regarding the biology of these structures, apparently they agree that this covering which extends from its attachment at the base of the gingival crevice is uninterrupted and is resistant enough to provide protection to the deeper tissues, and, hence, bleeding from them occurs only as the result of an injury. It will be understood in this paper that by gingival hemorrhage, the escape of blood from the vessels of the soft tissue overlying the crest of bone supporting the teeth is meant. Bleeding may be induced by laceration from a mechanical injury (rhexis); ulceration due to use of the cautery or to disease (diabrosis); oozing through the intercellular spaces of the vessel walls due to alteration in them or in the blood pressure (diapedesis), or any combination of these methods. Many infective, metabolic, nutritional, neuropathic and malignant factors which enter in are purely contributory as far as the hemorrhage itself is concerned, although they may directly predispose to the lesions of which bleeding may be one of the circulatory disturbances.

Bleeding is associated with many of the inflammatory reactions (septic or aseptic) of the gingivae and especially those of the type in which the vascular changes predominate.

The latter fact makes the attempt at classification of the causes of gingival hemorrhages a tedious and unsatisfactory one. A simple summarization of the etiology might be made in two divisions, and the second division subdivided again in two parts.

The first of these will include the direct causes, such as local injuries of traumatic origin, and an indirect second group including hemorrhages from the gingival lesions associated with the blood dyscrasias, as being specific, and with all others as being nonspecific.

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The more common forms of traumatism to the gingivae which may produce hemorrhage are the improper use of the toothbrush, dental floss and toothpicks; the impingement of dentures or their attachments, and of regulating appliances; improper placing of ligatures; scaling; gingival resection; tooth removal, and food impaction due to faulty occlusal and axial restorations or due to lack of contact. The attendant bleeding is usually self-limited and causes little or no concern, although when inflammation is present in these tissues, hemorrhages, which may be rather profuse, can be caused by the lightest of irritations. When capillary resistance and the bleeding and clotting of the blood are normal, bleeding is usually only of primary importance. "Primary" bleeding is that which takes place following an injury, such as occurs at the time of operation, in contradistinction to intermediate hemorrhage, which recurs within a few hours following, or secondary, which can begin after a day or two have elapsed. When the bleeding and clotting time is not normal, traumatism from the foregoing causes, especially surgical procedures, with hemorrhage, may be of considerable significance.

Occasionally, intermediate or secondary bleeding will follow gingival resection or tooth removal because of injury to one of the deeper gingival vessels. Frequently, a large fibrous mushroom type of clot, which moves about to prolong the flow of blood, will form. Occasionally, one of the smaller vessels near the surface of granulation tissue will open and bleed, causing annoyance to the patient.

Among those cases in which predisposing conditions enter, there can be found several pathologic processes which have gingival hemorrhage as an early clinical manifestation. Hemorrhage plays a minor part in the differential diagnosis of gingival lesions, although no differential diagnosis of hemorrhage *per se* can be made. Only the character and amount of bleeding may be noticed, the duration determined and the location sought.

Although more or less characteristic alterations may be found in the gingival tissues during pregnancy, diabetes, nephritis, severe septic processes, jaundice, industrial poisoning and certain types of general medication, persistent bleeding without apparent local irritation is most likely to be the initial symptom of scurvy, Vincent's infection, uremia, thrombopenia, purpura, leukemia, hemophilia, anemia or other conditions which may have a hemorrhagic diathesis. In the literature, one frequently reads of the marked gingival lesions associated with these systemic disturbances. This may be true in the advanced stages, but I have found it extremely difficult, in many cases, to detect any evidence of a disturbance of the health of the gingivae. This emphasizes the value of knowing the patient's physical condition and the history of bleeding. Dentists should also know the normal range of the bleeding (from two to three minutes) and clotting time (from four to six minutes) and the simple methods for their determination, as well as the therapeutics of preoperative medication and postoperative management with drugs, compresses or serums. Recurrent or prolonged gingival hemorrhage without local irritation or injury calls for complete blood examination including a hemoglobin determination, total erythrocyte and leukocyte count, qualitative differential study of the leukocytes and determination of the bleeding and the clotting time. A number of these conditions have no demonstrable blood changes of importance.

Tooth eruption may be accompanied by the formation of a blood blister, which may open and cause some anxiety to parents. During the severe infectious diseases of childhood, i.e., diphtheria, scarlet fever and measles, hemorrhagic tendencies may be manifest also in the gingivae. (Rosenthal.) Other severe septic processes may have hemorrhagic diatheses with tendencies to bleed from the mucosae, and particularly the gingival margins.

In these days of rigid, self-imposed diets, there is frequently a failure to maintain the proper degree of balance, which leads to alterations which might be termed potential scurvy.

A number of cases in which bleeding from the gums occurs might be due to such scorbutic tendencies. The diet is commonly found to be faulty.

REPORT OF CASES

Case 1.—M. C., a girl, aged 14, came in because of bleeding and sore gums, with slight tumefaction of the papillae. She ate no breakfast. Her lunch, eaten at school, consisted of a bottle of pop and a sandwich. For dinner, she had soup, boiled meat, potatoes, bread and coffee. No other fresh or cooked vegetables or fresh fruits, no milk, cheese or butter were eaten. After local treatment of what appeared to be an early Vincent's infection, the patient, who was rather plump, still refused to eat these foods; first, because she did not like them and, secondly, for fear of putting on weight. After recurrence of the gum condition, this was insisted on and there has been no second recurrence. Blood examination revealed: leukocytes, 9,300; polymorphonuclears, 64 per cent; lymphocytes, 30 per cent; monocytes, 4 per cent; eosinophils, 2 per cent. A smear revealed no abnormal cytologic condition of the leukocytes. Bleeding time was two minutes and forty-five seconds; clotting time five minutes and thirty seconds.

Much has been written on the recognition and management of Vincent's infection, yet, in its incipient or chronic stages, bleeding from a few gingival points may persist in spite of meticulous care. It is apparently a relatively easy matter to reduce the acute manifestations, as evidenced by the variety of methods of treatment which are being used, while those who have it in the chronic form are not so easily helped. The prophylactic value of having highly polished crowns, replacing faulty reconstruction; maintaining a high degree of mouth cleanliness; proper diet, and abstinence from smoking and from stimulating carbonated drinks cannot be overestimated in these cases. Hemorrhage is one of the first signals of a recurrence, and patients who have had treatments for Vincent's infection should be instructed to watch for bleeding points as a signal of possible recurrence so that prompt measures can be taken to control the process as well as to protect others from contamination.

Case 2.—M. L. W., a woman, aged 25, came in June 9, 1928, with typical subacute Vincent's infection. The symptoms subsided completely within a few days after the beginning of treatment. Bleeding, painful gums brought the patient back two months later. This time, several faulty crowns and alloy fillings were replaced after treatment. The patient's habits, diet and home care of the mouth were rechecked and found to be good. All symptoms subsided in about forty-five days. Six months later, the gum condition reappeared, with bleeding points. This was again quickly checked. Fourteen months later (June, 1930), the patient returned again with bleeding gum points. Physical examination was reported negative.

Hemanalysis revealed: hemoglobin, 88 per cent; red blood cells, 4,850,000; leukocytes, 7,300; polymorphonuclears, 59 per cent; lymphocytes, 36 per cent; eosinophils, 1; basophils, 0; blood platelets, 220,000. A smear showed no immature leukocytes.

Urinalysis revealed: urine, amber colored; specific gravity, 1028; albumin, 0+ (thought due to many epithelial cells); sugar, none; few leukocytes; many epithelial cells.

The patient responded sluggishly to treatment. The diet and home care continued to be carefully carried out.

I have been unable to find any condition other than possible repeated reinfection or an early undetected systemic disturbance to which this case could be ascribed.

In many cases, there is an ulcerative type of gingivitis which is frequently accompanied by gingival hemorrhage as an early clinical symptom, and commonly diagnosed and treated as Vincent's infection before the general features of the disease can be detected. This is especially true of leukemia.

CASE 3.—A girl, aged 17, had swollen and spongy gums which bled easily when touched. Several small ulcerative areas were present when the case was first seen. The physician applied silver nitrate to them to relieve pain. When the cauterized tissue sloughed, these areas were enlarged and became more painful. Equal parts of water and fresh peroxid as a regular mouth wash afforded comfort, although the lesions seemed to linger until the general condition improved. Smears revealed fusiform bacilli and spirochetes in large numbers. The blood smears revealed a chronic lymphatic leukemia.

Cases of prolonged Vincent's infection which do not clear up should have a qualitative analysis of the leukocytes made with special emphasis on the state of maturity of lymphocytes and polymorphonuclear neutrophils. This is important in the detection of this disease. Many of the cases of so-called agranulocytic angina, if more correctly diagnosed may be called acute leukemia, proper identification of the immature types of blood cells having been made.

Uremia is another condition in which bleeding from the gums may be the first symptom. The following case history shows this to be true and also agrees with the foregoing statement concerning the frequent absence of gingival lesions in nephritis.

CASE 4.—W. B. had had attacks of nephritis for twenty-eight years. He had been continuously ill for the past two years. Uremia had developed recently. "He had never had trouble with the gums before." Spontaneous bleeding and a bad taste developed three or four months ago. The gums bled on slight pressure. There was a marked loss of interdental papillae, with definite cupping in many spaces, which were filled with a greyish necrotic material, suggesting subacute Vincent's infection. Local symptoms were reduced by treating the conditions as a Vincent's infection.

Hemanalysis revealed a slight depression of the total white cell count (6,850) with a neutrophil percentage of 76 and lymphocyte percentage of 17. It is interesting to note that the condition was found in the medical record, under the heading "Mouth." "Teeth O. K. First molar lower right jaw extracted. Patient hasn't had his wisdom teeth yet. No pyorrhea." The existing condition was completely overlooked.

Thrombopenia, in which the number of blood platelets is reduced, is another condition which may produce hemorrhages beginning with the gingivae. Frequently, petechial spots may be seen in the mucosae, when the patient should be carefully questioned about the tendencies to bleed following minor cuts or easily produced black and blue spots which take a long time to disappear. Inquiry should be made regarding petechial hemorrhages in other parts of the body and the history taken of bleeding of the patient's parents, brothers or sisters.

Here the bleeding and the clotting time, and capillary resistance tests are in order.

CASE 5.—A woman, aged 26, on the gynecologic service (Dr. Cruttenden) was in bed for three days after extraction of her teeth. Her mother was taken to the hospital for hemorrhage after removal of teeth. Her sister, who once acted as donor for her, had no retraction of the clot after seventy-two hours. Any bumps produced black and blue spots that took a long time to disappear. Bleeding from the gums was spontaneous at times, and the gums bled easily after brushing of the teeth. No local cause for gingival hemorrhage was evident. The patient had never had treatment for the gum condition. No

hemorrhages had occurred from other mucous membranes or the skin. The patient suffered from menorrhagia. Hemanalysis is given in the accompanying table:

Five blood transfusions were given during the stay in the hospital. At the present time, the patient has a hemoglobin of 50; red blood cell count, 2,450,000 and platelets, 70,000. She is in apparently good health, with no gingival disturbances. The upper left lateral and right central and lateral incisors have root-canal fillings. The lateral incisors show radiolucent areas about apices and are badly discolored.

The advice of one authority that "the dentist should be able to determine accurately, and make an intelligent report as to all pathologic and contributing causes within the mouth when there is systemic trouble, and of more importance, he should positively be able to eliminate all oral sources of systemic disease" should be accepted with caution in this type of case.

The gingival hemorrhage in cases of hemophilia is the result only of trauma to the tissues. The tissues do not bleed spontaneously externally although injuries, which may be so slight as to be regarded as negligible, may produce a copious flow of blood. Scaling must be done with caution, and a premeditated gingival resection in a known case of hemophilia would constitute the sheerest folly. The well-known fact that hemophilia is an inherited tendency of males (only) and is transmitted only through the female line bears repeating. The history of the maternal grandparent and of tendencies to bleed among the patient's brothers are of interest. Few of these patients reach advanced age, because a minor injury results in an uncontrollable hemorrhage. The bleeding time is prolonged, while the clotting time may remain near normal. The reverse is true in the case of purpura. The advisability of making these two simple tests is again emphasized.

The hemorrhages from the gingival tissues which are found in anemia usually appear in only the advanced stages of the disease. This applies particularly to pernicious anemia, which has an otherwise characteristic oral clinical picture. The history of sore tongue is important. Hemorrhage may be one of the latest symptoms to appear in aplastic anemia, a condition which results from exhaustion of the hematopoietic tissues and is commonly accompanied by profuse gingival hemorrhage. These patients are not ambulatory and undoubtedly will be seen only in medical consultation. Any local treatment which may be given is purely symptomatic and of little avail.

In examining these cases of gingival hemorrhage, visibility is of first importance in determining the character of a hemorrhagic area. An effective agent is hydrogen peroxid, which may or may not be diluted with water. It tends to remove sordes and partially clotted blood, to

HEMANALYSIS (CASE 5)

Date	Hemoglobin	Red Blood Cells	Platelets	Bleeding Time Min. Sec.	Clotting Time Min. Sec.
6-17-29	25—	1,390,000	.....	. ..	. ..
7- 6-29	35—	1,600,000	184,000	. ..	. ..
8 -6-29	35—	1,980,000	60,000	5 55	6 20
10-14-29	48—	2,590,000	22,500	8 00	5 10
11-19-29	48—	2,190	22,000	. ..	. ..
11-29-29	....	.....	.....	14 00	7 00
12-13-29	....	.....	.....	10 20	. 11

provide a clear field. It is essential to differentiate between induced and spontaneous bleeding. This may be done from the history as well as the clinical manifestation. An attempt should be made, if possible, to determine whether bleeding is from a single vessel, a macerated area of tissue or a generalized diffused area of oozing. The actual cautery and concentrated drugs such as chromic acid, silver nitrate, trichlorid acid and phenol are without avail and are strongly condemned in the blood dyscrasias. Serums may be injected when the blood findings appear to be normal; intramuscular injections of whole blood used in purpuric conditions, and transfusions used in cases of hemophilia. The preoperative measure of choice in hemophilia is transfusion. While it is probably outside the scope of the title, an outline presenting the more common therapeutic measures seems in order.

The therapeutic measures for gingival hemorrhage falls logically in two groups as being local or general measures.

Local measures:

1. Pressure may be applied by biting on:

(*a*) Cotton or gauze (supplemented by drugs). (*b*) Wax. (*c*) Modeling compound. This may be supplemented by external head bandages.

2. Sutures.

3. Drugs:

(*a*) Hydrogen peroxid. (*b*) Solution of ferric subsulphate (or other iron compounds). (*c*) Adrenalin (epinephrin) chlorid. (*d*) Tannic acid. (*e*) Water to which 5 or 6 drops of phenol to the glass has been added.

4. Serums (applied topically).

Thromboplastin.

5. Foreign proteins (such as whole blood).

6. Cauterization with heat.

7. Ligation of vessels.

General measures:

1. Foods which contribute to a raised calcium level.

2. Drugs.

(*a*) Calcium lactate. (*b*) Irradiated ergosterol.

3. Serums.

(*a*) Oral administration. (*b*) Injection (coagulin, thromboplastin, etc.)

4. Blood transfusion.

In addition to any of the foregoing measures which might have been employed, the patient should be cautioned against the frequent use of saline mouth washes, to abstain from stimulants, to avoid exertion which would raise the blood pressure through increased heart action and to assume an upright or semi-upright position to enable gravity to reduce the blood pressure in the head.

SUMMARY

1. Patients with hemorrhagic tendencies commonly have no clinical alterations of the gingival tissues.

2. Spontaneous gingival hemorrhage may be one of the earliest manifestations of Vincent's infection, uremia, thrombopenia, purpura, leukemia or other conditions which may have a hemorrhagic diathesis.

3. Spontaneous gingival hemorrhage indicates at once a complete hemanalysis including hemoglobin determination, total erythrocyte and leukocyte counts, a qualitative differential study of the leukocytes and determination of the bleeding and clotting time and of capillary resistance.

4. Dentists should be familiar with the normal blood values as well as the technic of determining the bleeding and clotting time in order to know whether the bleeding is of local or general importance.

5. The preoperative and postoperative therapeutics of hemorrhage can be more generally understood.

6. It is no disgrace to invite medical cooperation.

357 Lowry Building.

DISCUSSION

S. C. Gilmore, Columbia, S. C.: Dr. Epstein spoke of the use of sutures in hemophilia. I have found that a rather dangerous procedure. I should like to have him explain that.

Dr. Epstein, St. Paul, Minn.: That is not what was implied. I quite agree that general measures are usually the only effective ones. I might cite one case. We have dental interns working in hospitals and they make mistakes as other interns do. The patient's history was one of bleeding on the maternal side, a hemophilia of a definite character, and, without supervision, the intern decided to take out a first molar, which was done. Apparently there was no bleeding the first half day; later, there was. The bleeding was checked with serums injected locally. In that case, it did not make any difference whether there was a puncture or not. Several days later, the bleeding started again, and an attempt was made to control it locally by pressure packs, and somehow the blood got into the fascia of the neck and trouble developed. Blood transfusion, together with injection of whole blood into the pocket, corrected the condition. The blood did not have to be typed in the latter case as it does for transfusion.

H. S. Burkhardt, Seattle, Wash.: My experience in Vincent's work has shown me that we must pay considerable attention to the condition of the tonsils as well as to other conditions in the mouth, and I should like to ask Dr. Epstein whether he checked the tonsil condition in this case, and if the tonsils had been removed, whether there might be recurrent stubs of tonsils present. I have found that if tonsils are present in cases of Vincent's infection, either acute or chronic, the deep crypts in the tonsils are a definite source of constant, slow, low-grade reinfection. When one cannot clear up a case, he is apt to find such a condition is the cause. I recently had a case of acute Vincent's infection which was general throughout the mouth. The patient, a brick-layer, came in because of pain. In addition to other things during the examination, I questioned him about his tonsils, which were present and considerably enlarged. The smear showed definite, active Vincent's infection. I treated him to reduce the pain and inflammation and insisted that he have the tonsils removed at the earliest opportunity. At the end of the treatment, a complete negative smear was obtained from the mouth, and I dismissed the patient, expecting him to be back within a short time to proceed with some pyorrhea work that was necessary. When he finally came back, he had a recurrent Vincent's as shown by a smear. I told him that he would have to have his tonsils out, but he said he could not afford to stop work at that time. I again checked the acute condition and I warned the patient that it would be necessary for him to have his tonsils out. About two weeks later, he returned with a reinfection from the tonsils. This time I told him that unless he had his tonsils removed immediately, I should have to refuse to take care of his case any longer. I reduced the pain again, and then referred him to the eye, ear, nose and throat department, where he is at present under treatment with definite instructions that his tonsils must be removed. It is necessary to check the tonsil condition if one expects to cure Vincent's infection.

Dr. Epstein: In the particular case which I have just cited, the tonsils had been removed and there were no fusiform bacilli. As to smears, in this case I found them as unreliable as a pulp test. I do not know how to interpret smears. Many say that they can tell the condition by means of dark-field illumination. I have taken Vincent's organisms out of my own mouth and I have found them in eighty out of ninety people whose gums were apparently healthy.

Arthur H. Merritt, New York City: I would like to raise a question regarding the chronic case of Vincent's infection that Dr. Epstein has called to our attention as to whether a high standard of mouth hygiene was maintained.

Dr. Epstein: Yes, definitely.

Dr. Merritt: I find that in so many of these cases the operator depends on medical care rather than on a most thorough and meticulous oral hygiene. As regards the case Dr. Burkhardt called attention to, I should like to raise the question as to whether, since

this patient was reported to have an advanced case of periodontoclasia, it was not the residual matter in these deep periodontal pockets which caused recurrent infection. I have never found a case that did not respond to proper treatment without particular regard to the tonsils unless they were infected. In all of these cases, in the use of the oxidizing mouth wash, I advise the patient to see that the mouth wash come in contact with the tonsils.

Dr. Burkhardt: Perhaps I made a misleading statement about the condition of periodontoclasia in the patient's mouth. I meant to convey that the treatment to be followed in that case was principally thorough prophylaxis and attention to mouth hygiene and care at home. There were no pockets other than between the second and third molars, which were subsequently removed because of the crowded condition in the patient's mouth. The mouth showed merely a lack of home care and the necessity for a good prophylactic treatment. The gingival tissues were not destroyed, and the attachment was not destroyed.

B. A. Murray, Denver, Colo: Dr. Epstein said that hemophiliacs were always males. Authorities generally concede that this is true. My own experience leads me to doubt it. Some of the worst cases of hemophilia that I have seen, if I am able to diagnose hemophilia, have been in females, not necessarily pregnant women either. One case that was examined by one of the most learned men in the university with which I am connected was pronounced to be a hemophilia, notwithstanding the fact that the patient was a female.

Dr. Epstein: If a woman were a hemophiliac, she would probably not live past the age of 14. There are certain characteristics about a hemophilia by which it may be easily differentiated from a purpura, a condition in which there is a tendency to bleed as in hemophilia. The bleeding time is prolonged and clotting time may be normal. In hemophilia, it is just the reverse: the clotting time is prolonged and the bleeding time is normal. There are certain other things that determine whether a case is hemophilia or purpura. You may have had a case like the one I cited in which there was a tendency to bleed in the sisters and mother, but the definition of true hemophilia falls in line with what I have told you. It is very easy to become confused. I do not discredit the man who made the diagnosis.

Dr. Murray: That was what I had in mind in the case that I just spoke of, and for that reason I called in the eminent physician. Menstruation is a physiologic condition, he stated, and for some unaccountable reason, Nature took care of these people, notwithstanding they were hemophiliacs.

Member: I was called in consultation in a case of hemophilia a few months ago. The patient was a woman. She died at the age of 66.

Dr. Epstein: The medical profession has made assertions that we do not know the pathology of the conditions with which we deal. A physician may be just as mistaken as a dentist.

A. T. Rasmussen, La Crosse, Wis.: I have also seen a case of hemophilia in a woman. I was called about midnight. A woman had been told that she was a hemophiliac and there was nothing to be done. She was bleeding from several tooth sockets, the teeth having been removed two days before. The dentist who had removed them had been called in. Later in the day, he had been called again and this time brought the family physician with him. They had stayed for two hours, pronounced the patient a hemophiliac, and said that nothing could be done for her. In two hours, I had the hemorrhage stopped. It was early in my professional career. I used iron preparations, but they did no good. I could control the bleeding by pressure, but when the pressure was released, the condition was just the same. I then did what I think we all do in an emergency, something I had never heard of. I made a syrup of tannin and alcohol. I put in a plug of that. The woman was not a hemophiliac, as any one could see. But she had been so pronounced and had been left to die.

S. R. Parks, Dallas, Texas: Referring to the matter of bacteriologic examination in suspected Vincent's infection, I should like to call the attention to the fact that Dr. Beust of Louisville, of the Research Department of the American Dental Association, in 1928 found conclusively that examination by smear was of no value whatsoever.

Earl Smith, Texarkana, Texas: I would like to have Dr. Epstein briefly outline the treatment that he has given in the case of recurrent Vincent's infection that he could not control.

Dr. Epstein: This is not a method that I alone have been using. A group of us have been using this treatment for some time. First, be sure the diagnosis is approximately correct. I use a mouth wash with a spray to get the mouth in a generally clean condition. A spray of half hydrogen peroxid and half water is used. I have one of these three-minute-egg timers that is used for many things around the office. I allow the hydrogen peroxid to remain in the mouth for periods of three minutes, possibly four or five times. Thereafter, neo-arsophenamin is used, 0.45 gm. in 10 c.c. of distilled water. This is applied with cotton about the size of a large walnut, gloves being used, with a hemostat. This is applied to the outside of the lips, the inside of the lips, the tongue, the palate, and as far back in the throat as the patient can stand it, and allowed to remain for a period of three minutes, during which time the patient washes it around between the teeth. There is usually enough left for another application with a ball of cotton about the same size, and the patient is dismissed. Ordinarily, we find that comfort comes in about two or three hours. When we see the patient, the next day, no change is perceptible. It looks as if we have not done any good at all. The second day, the mouth is flushed with hydrogen peroxid, but it is not necessary to use neo-arsphenamin. On the third day, the process is repeated. On the fourth day, the mouth should look fairly well. In addition, of course, the patient uses a home mouth wash. I have discontinued using the mercuric bichlorid and hydrogen peroxid wash because of the druggists' telling the patients that it is dangerous to use it. Many times, I used hydrogen peroxid and water, half and half, for a mouth wash and again a solution (I believe Reichmann published this, although it is not original with him) containing peroxid, ipecac, solution of potassium arsenite (Fowler's), glycerin and water. A freshly prepared solution of aromatic sodium perborate is sometimes used. The patient is told to use it four times a day, just as he would use the hydrogen peroxid in the office. In this particular case, there seemed to be little improvement. A great many of my friends are enthusiastic about trichloracetic acid. I applied that to no avail. New ulcerations broke out about a quarter of an inch above the gingivae. I gave that up and next used chromic acid. I then went back to the original treatment, and I did what others do, trying first one thing and then another. The patient's diet was inquired into. She had two oranges every morning, and a quart of milk a day. She was getting all the elements she needed without the butter fats that add weight, for she was taking skimmed milk. She is meticulous in the care of her mouth and is doing exactly what I advised her to do. Still there is this Vincent's infection.

Olin Kirkland, Montgomery, Ala.: In one of my cases, a surgical flap operation, the patient had bled for two days, and we had given him horse serum and tried a little of everything that was recommended in checking hemorrhage and had failed. The patient was beginning to get alarmed about his condition, and I had begun to feel the same way. It occurred to me that we had the teeth to depend on for pressure. I took some hard, sticky bridge and crown wax, softening it so that I could press it in between the teeth, using a spatula to get it completely through from the medial surface to the buccal surface. In this way, pressure was created and stopped the hemorrhage at once. I had another case in which the patient had bled for about twenty-four hours before I knew there was a hemorrhage. I treated it in a similar manner, and the hemorrhage was checked instantly without any further consequences. If there is a hemorrhage in the antiproximal areas in the mouth, and you fail to get results with other treatment, I know of nothing that will give you quicker results than the remedy I tried.

Clyde C. Sherwood, Toledo, Ohio: I should like to ask Dr. Epstein how much value he places on the home treatment of the patient in relation to the ultimate success of his case and also as to whether he differentiates between Vincent's angina and Vincent's infection.

Dr. Epstein (closing): I think that the home care is very important. We do one-fourth of the work and the patient does three-fourths. As to the difference between Vincent's angina and Vincent's infection, Vincent's angina is Vincent's infection of the throat, and Vincent's infection, in the usual sense of the term, is Vincent's infection of the area immediately surrounding the teeth.

THE RELATIVE EFFICIENCY FROM A BACTERIOLOGIC STANDPOINT OF SOME MATERIALS USED IN THE TREATMENT OF PUTRESCENT ROOT CANALS*

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THE aim of this work has been to determine, from a bacteriologic standpoint, the efficiency of various medicaments used in an attempt to sterilize putrescent root canals, preparatory to filling them. More specifically, we have endeavored to place some of the newer preparations recommended and used in root canal therapy, in relation to the older and better known materials.

The work has been divided into three distinct parts: (1) the treatment of single rooted putrescent teeth *in vivo;* (2) the test tube experiment in which pure strains, isolated from the canals treated in Part 1, were subjected to the action of the disinfectants for varying lengths of time, and (3) the action of the disinfectants on strains isolated in Part 1 and placed in the canals of single-rooted extracted teeth.

PART I—BACTERICIDAL VALUE OF DISINFECTANTS IN VIVO

This phase (Part I) of the work was performed in putrescent root canals with the teeth in normal position. Adult patients between the ages of 20 and 40 years were selected. All patients were apparently in good health and willing to lend themselves to the requirements of the investigation. Only anterior, single-rooted and easily accessible teeth were used, which minimized the physical obstacles to root-canal surgery.

The germicides were as follows:

1. Solution S. T. 37 (liquor hexylresorcinolis, 1:1000, Sharpe and Dohme). 2. Dichloramin T (Abbott). 3. Sodium ricinoleate 40 per cent (Merrell). 4. Beechwood creosote (U. S. P. X. Merck). 5. Osogen fluid (Caulk). 6. Dakin's solution nuklorene (De Sanno & Hoskins).

Each was used, as far as possible, on a series of cases ranging from severe apical rarefaction to little or no rarefaction. Roentgenograms were made before treatment. In every operation, the tooth was isolated by means of a rubber dam and the field of operation cleaned thoroughly with 95 per cent grain alcohol and then allowed to dry. All instruments were scrubbed with a brush and pumice soap, and kept in 95 per cent alcohol for some time before using. Pliers were carefully flamed, and cooled in alcohol after each time of use. J&J absorbent cotton points were placed in short broad test tubes, plugged with nonabsorbent cotton and autoclaved at 15 pounds pressure for two hours. These tubes were flamed when opened and closed, and were entered only with well flamed pliers.

The method of introducing the disinfectant into the canal was as follows:

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*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-First Annual Session of the American Dental Association, Washington, D. C., Oct. 8, 1929.

1. The pulp chamber was opened wide and cleaned for approximately two thirds of the distance to the apex. 2. At this point, cultures were made into serum and dextrose-veal infusion broths, sterile J&J absorbent cotton points being used. The dextrose broth was boiled vigorously for a few minutes, cooled quickly, inoculated and sealed with sterile petrolatum (vaselin). After Case 12, this anaerobic culture was discontinued, because it seemed unnecessary, since we failed to get strict anaerobes. 3. A control culture was made of a sterile point exposed to the air near the field of operation. After the cultures were made, a sterile cotton point saturated with the germicide in question was placed in contact with the remainder of the canal, and sealed with a temporary filling after the cavities were moistened with oil of cajuput. After several days, other cultures were made, and the treatment was repeated until the case was dismissed. The canal was filled according to U. G. Rickert's method, when the cultures showed it to be free from infection. Roentgenograms were taken at the time of filling and checkup, roentgenograms were taken every three months thereafter when possible.[1]

A mixed infection appeared in most of the canals. Only a few cases showed a pure

Fig. 1.—Arrangement of necessary equipment.

1. Details of the foregoing methods may be found in Appleton, J. L. T., Jr.: Bacteriological Control of Treatment of Periapical Infection, Dent. Items Int., 49:589-597 (Aug.) 1927. Fierer, W. A., and Leonard, Veeder: Hexylresorcinol in Oral Antisepsis with Special Reference to Solution S. T. 37, Dent. Cosmos, 69:882-892 (Sept.) 1927. Rickert, U. G.: My Present Conception for Control of Dental Foci of Infection, Dent. Cosmos, 69:451-462 (May) 1927.

strain in the pretreatment cultures. In some cases, we found a secondary infection after the opening of the canal. The organisms that occurred were *Staphylococcus albus,* and the streptococcus, alpha, beta and gamma strains. Some typical diplococcic strains were isolated, and a few bacillary forms. The rod forms did not seem to classify easily, according to Bergy's Manual, and time did not permit a determinative study of them. It seemed quite interesting that only *Staphylococcus albus* occurred, even when a golden yellow purulent exudate was taken from the canal. *Staphylococcus aureus* did not appear on the plates. With our methods we did not find any strictly anaerobic organisms. F. Schick and M. Fischer[2] have isolated three types of anaerobes from gangrenous teeth, by the use of brain pulp medium, but with a simple, standard anaerobic medium that a practitioner might use without much difficulty, we found only facultative organisms.

In the following tables are records of twenty-two teeth that have been treated. When it was impossible to sterilize the canal with the material that was being used, another was substituted. It was realized that it was not the most desired research technic, but since the number of desirable and willing patients was insufficient, the subsequent treatments were recorded as subcases. Thus, data have been secured on forty-one cases. There are not enough data to establish facts, but we feel that there are definite indications as to the value of the different materials in treating infected root canals.

The data on thirteen cases in which solution S.T. 37 was used initially show

Fig. 2 (Case 1).—Above: Left, appearance of tooth at time of pretreatment (Jan. 11, 1928); center, appearance when filled (Feb. 2, 1928); right, appearance five months later (May 30, 1928). Below: Left, appearance twelve months later (Dec. 17, 1928); right, thirty-five months later (Nov. 13, 1930).

2. Schick, F., and Fischer, M.: Anaerobe Bacterien des Wurtzelkanals, Deutsch. Monatschr. f. Zahnheilk., 334-345, 1929.

that these cases exhibited various degrees of rarefaction at the apices and a good distribution of organisms. The number of treatments given range from two to twelve and cover a period of from eight to fifty-four days.

Of the thirteen cases, only one yielded negative cultures, and this was a doubtful case because the root was filled when only one negative culture had been obtained. This seems to indicate that solution S.T. 37 is practically valueless in the sterilization of putrescent root canals. Leonard and Feirer[3] have reported very favorably on this solution, and their recommendations have been so encouraging that the results of this work are in striking contrast. This indicates that test tube results are not to be relied on in determining the value of a germicide to be used *in vivo*. The duration of the treatment, in most cases, was too long to be practical, even though it had been ultimately successful.

The one case treated with solution S.T. 37 that was filled had an apical area that was almost normal. Three "check-up" roentgenograms were taken, one three months later, one ten months later, and the last thirty-four months after the root was filled. These roentgenograms showed practically no change in the apical region. No retrogressive changes have occurred and the tooth has been perfectly satisfactory to the patient. (Case 1, Fig. 2.)

Beechwood creosote was used initially only four times. It followed solution S.T. 37 eight times, sodium ricinoleate twice, osogen fluid and dichloramin T once and aqueous chlorin 4 per cent, dichloramin-T and sodium ricinoleate once. It was used sixteen times and failed to produce consecutive negative cultures in only four cases. Beechwood creosote has been fairly consistent in its action, and negative cultures were obtained very quickly in most cases after its application. In the cases in which it failed to produce negative cultures, the treatments covered periods of fourteen, nineteen, thirty-one and seventy-three days. In the cases that covered thirty-one days, two negative cultures were obtained, and then it stood from March 9 to April 3, 1928, at which time it was filled, a culture taken showing gram-positive streptococci.

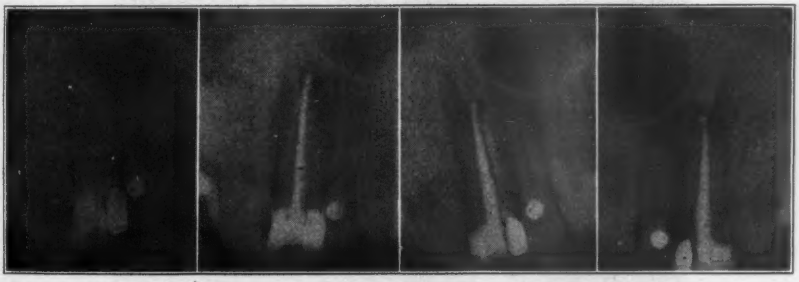

Fig. 3 (Case 2)—Left to right: Appearance of tooth at time of pretreatment (Feb. 3, 1928); when filled (March 1, 1928); eight months later (Oct. 12, 1928); fifteen months later (May 24, 1929).

3. Feirer, W. A., and Leonard, Veeder: Hexylresorcinol in Oral Antisepsis, with Special Reference to Solution S. T. 37, Dent. Cosmos, 69: 882-892 (Aug.) 1927.

It was possible to maintain a sterile condition in a number of the cases for some time before filling the canal. In one case, thirty-five days elapsed from the time of the first negative culture until the canal was filled. During this time, negative cultures were consistently obtained. In our estimation, beechwood creosote is one of the best medicaments used in this work. It seems to be as efficient when used after other treatment as when used initially. The only undesirable characteristic of creosote is that it coagulates albumin, and we are by no means certain that this limits its action.

In the cases in which beechwood creosote was used, there was a range of from slight to distinct rarefaction in the apical region. In every case in which roentgenograms were taken after treatment, an apparent improvement in the apical area is demonstrated. A distinct apical rarefaction involving 3 mm. of the root is seen in Case 12, in the film taken at the time of filling the canal. The canal, in this case, was filled before negative cultures were obtained. The picture taken of the tooth five months later shows a decrease of rarefaction, and in twelve months there was practically complete filling in of the rarefied area.

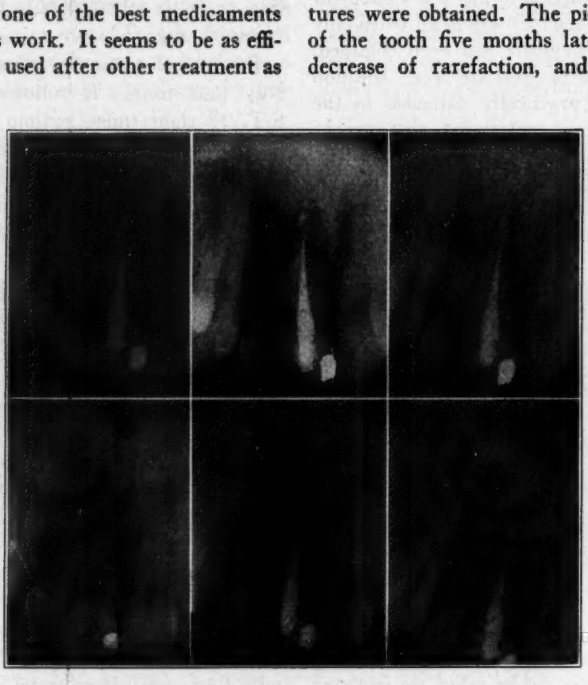

Fig. 4 (Case 3).—Above: Left, appearance of tooth at time of pretreatment (Feb. 10, 1928); center, when filled (April 19, 1928); right, eight months later (Oct. 8, 1928). Below: Left, eleven months later (Jan. 17, 1929); center, fourteen months later (April 16, 1929); right, twenty-one months later (Oct. 29, 1929).

Dichloramin T was not used initially but secondarily in five cases. Only one canal gave negative cultures. This was in Case 4, initially treated with S.T. 37. The roentgenograms of this tooth show

a filling in of the rarefied apical region. One year after treatment, there is a slightly rarefied area at the apex. This disinfectant, as well as the remaining three employed in this part of the work, namely sodium ricinoleate, osogen fluid and 4 per cent aqueous chlorin, has not been used in enough cases to justify any conclusions as to its value in root canal therapy.

Osogen fluid seems to be the most promising. However, it is quite irritating, the patients experiencing discomfort for several hours after the first applications.

During the time between the report and publication, further data have been secured. (Table 1, and Figs. 1-8.)

TABLE 1.—MATERIALS USED AND THEIR RELATIVE EFFICIENCIES*

MATERIAL	No. of Cases	No. Sterilized	No. Not Sterilized	Efficiency Per Cent
Solution S. T. 37	16	1	15	6
Beechwood creosote				
(a) initial	4	3	1	
(b) second	10	7	3	
(c) third	1	1	0	
(d) fourth	1	1	0	
Total	16	12	4	75
Dichloramin T—5%	5	1	4	20
Sodium ricinoleate—40%	3	1	2	33
Osogen fluid	3	2	1	66
Aqueous chlorin	1	0	0	0

*The outstanding results shown in Table 1 are the apparent failure of S. T. 37 and the consistent results from the use of beechwood cresote. The other materials were not used in enough cases to warrant serious comparisons.

PART II—BACTERICIDAL VALUE OF DISINFECTANTS IN TEST TUBE EXPERIMENTS

Most germicidal values have been determined as phenol coefficients or against standard type cultures; which, although indicative, does not prove their actual value in the root canal. Part II has been presented primarily to report the bactericidal efficiency of these medicaments against strains freshly isolated from putrescent pulps, and to correlate it, if possible, with the effectiveness of the medicament in the canal as shown in Part I. As lack of patients had made it impossible to use all of the disinfectants *in vivo,* more materials were used in the second part of the experiment than could be included in the first.

Thirteen disinfectants were employed. As some were introduced as the work progressed, they were not tested against all strains. Those used were: 1. Solution S.T. 37 (liquor hexylresorcinolis 1:1000, Sharpe and Dohme). 2. Sodium ricinoleate, 2 and 40 per cent (Merrell). 3. Beechwood creosote (U. S. P. X., Merck). 4. Osogen fluid (Caulk). 5.

Dichloramin T (Abbott). 6. Ammonical silver nitrate. 7. Ammonical silver nitrate and formalin (Howe). 8. Tincture of iodin. 9. Ethyl alcohol 95 per cent. 10. Formocresol (Lilly). 11. Cresatin and benzene (Kahlbaum). 12. Saturated aqueous solution of magnesium.

Sodium ricinoleate was used in both 2 per cent and 40 per cent solutions, but there did not seem to be much difference, so the former was discontinued, 40 per cent being recommended by Merrell. The ammonical silver nitrate was used separately to determine whether it had a germicidal value without the formalin (solution of gaseous formaldehyd, 40 per cent). The saturated solution of magnesium chlorid was used because it was a chief constituent of osogen fluid. It proved efficient in the few instances in which it was employed.

The organisms were isolated from blood-agar plates made from the initial cultures. When new organisms appeared during the course of treatment, they were isolated in the same manner. The cultures were isolated in dextrose-veal infusion broth, which contained Andrade's indicator, and were grown for three successive transfers of forty-eight hour intervals. One cubic centimeter of the third forty-eight-hour growth was subjected to the action of 9 c.c. of the disinfectant. At intervals of fifteen, forty-five, 105 and 405 seconds, a standard 3 mm. loopfuls was transferred to 10 c.c. of the dextrose broth. Controls were made by adding a loopful of the disinfectant to 10 c.c. of the medium and inoculating it from the stock culture. As a 3 mm. loop of osogen fluid was found antiseptic in 10 c.c. of broth, tubes containing 20 c.c. of the broth were substituted when osogen fluid was used.

Thirty-two strains were isolated, sixteen of the streptococcus, eleven of *Staphylococcus albus* and five bacillary forms. The streptococci were divided into seven strains of the alpha type, five of the beta type and four of the gamma type. This makes a group of typical organisms that are found in gangrenous pulps.

Fig. 5 (Case 4).—Left to right: Appearance of tooth at time of pretreatment (Feb. 27, 1928); when filled (April 12, 1928); eight months later (Oct. 10, 1928); twenty-seven months later (May 12, 1930).

A graphic presentation of these percentages is shown in Figures 9-11. The effectiveness of the materials as indicated by this experiment would rank them as follows:

1. Osogen fluid and saturated aqueous solution of magnesium chlorid. 2. Ammonical silver nitrate and formalin. 3. Tincture or iodin. 4. Ethyl alcohol, 95

per cent. 5. Beechwood cresote. 6. Solution S.T. 37. 7. Formocresol. 8. Dichloramin T. 9. Sodium ricinoleate. 10. Cresatin benzene.

From the standpoint of this experiment, osogen fluid is undoubtedly the most potent disinfectant used. It stands out very strikingly, with its 100 per cent efficiency within fifteen seconds. The unfavorable results, due to its irritating properties, make us hesitate to use it in root canal therapy. Incidentally, it also has a high surface tension, which must lessen its potential effectiveness. It stands high in the third part of the experiment. If one were considering only its bactericidal value, it would surpass the older preparations, such as tincture of iodin, alcohol and the formalin combinations.

Ammonical silver nitrate and formalin, prepared according to Howe's method, is indicated as deserving second place. That the action is due to the formalin, or the chemical change induced by its addition, is shown by the inactivity of the plain silver nitrate and ammonia. This silver solution is slightly antiseptic in the broth cultures, since, when it is added to the medium, there is a precipitation of silver chlorid. The growth in these tubes is not so abundant as in the others that show a positive growth. Formalin in any of its combinations is irritating and destructive to living tissues. This prejudices us against its use in root canals.

Ammonical silver nitrate and formalin, tincture of iodin and ethyl alcohol (95 per cent) came up to their old standards of efficiency in these tests, but because of their irritating, staining and similar characteristics are less desirable for the work *in vivo*. They are used in this experiment as they are more or less standard bactericides in root canal treatment. Beechwood creosote and formocresol are older disinfectants also. Formocresol has a lowered efficiency in this work. The staphylococci seem to be very resistant to it.

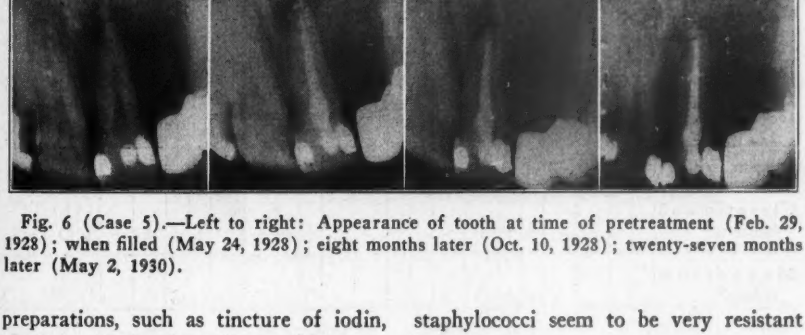

Fig. 6 (Case 5).—Left to right: Appearance of tooth at time of pretreatment (Feb. 29, 1928); when filled (May 24, 1928); eight months later (Oct. 10, 1928); twenty-seven months later (May 2, 1930).

Besides being quite reliable for use in teeth *in vivo*, as was indicated in Part I, beechwood creosote is consistent in its action in the laboratory tests. It is not so rapid as some in the first few seconds, but rises to a relatively high percentage (97 per cent) within the time limit used.

Despite all the unfavorable results with solution S.T. 37 in the first part of the experiment, it ranks above formocresol in this phase of the work. It did

TABLE 2.—ACTION OF VARIOUS MEDICAMENTS ON STREPTOCOCCI BEFORE AND AFTER SUBJECTION TO ONE PER CENT S. T. 37

	25 A Streptococci (Case 18)				25 A Streptococci (Case 18) S. T. 37				26 B Streptococci (Case 18)				26 B Streptococci (Case 18) S. T. 37				28 A Streptococci (Case 19)				28 A Streptococci (Case 19) S. T. 37			
Time (seconds)	15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405
S. T. 37	+	+	o	o	+	+	o	o	+	o	o	o	o	o	o	o	+	+	+	o	+	+	o	o
Dichloramin T	+	+	o	o	+	+	+	o	+	+	+	o	+	+	o	o	+	+	+	o	+	o	o	o
Sodium ricinoleate	+	+	+	+	+	+	+	o	+	+	+	+	+	+	+	o	+	+	+	+	+	+	o	o
Formocresol	o	o	o	o	+	+	+	+	o	o	o	o	+	+	o	o	+	+	+	o	+	+	+	o
Ammonical silver nitrate	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	o	o
Ammonical silver nitrate and formalin	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	+	o	o	o	o	o	o	o
Creosote	+	+	+	o	+	+	o	o	+	+	o	o	o	o	o	o	+	+	o	o	o	o	o	o
Iodin	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
95% alcohol	+	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Osogen	o	o	o	o	o	o	o	o	o	o	o	o												
Cresatin and benzene					+	+	+	+					+	+	+	+	+	+	+	+	+	o	o	o
Magnesium chlorid					+	+	o	o					o	o	o	o	o	o	o	o	o	o	o	o

not reach the efficiency expected. Its use in the canal we believe to be impractical, unless it can be incorporated in a series of materials, as has been suggested by other workers, for the purpose of lowering the resistance to subsequent germicides. (Table 2.)

Table 2 shows the results of a very limited work in which the organisms growing in a dextrose broth containing 1 per cent S. T. 37 are compared with similar organisms not so treated, when both were subjected to the action of germicides. Only in the instance of the A streptococci from Case 19 did we get a consistent lowering of resistance to germicidal action. More work must be done to determine this point definitely.

Dichloramin T has a better rating in the second part of the experiment than it had in the first. Even here, it does not come up to the standard of other preparations. Sodium ricinoleate in either the 2 or the 40 per cent solutions is not very

efficient when used against our strains. Cresatin (3 parts) and benzene (1 part), although used fewer times, does not show any effect whatever during the entire time limit.

PART III—A STUDY OF THE ACTION OF DISINFECTANTS IN CONTROLLING STREPTOCOCCI IN EXTRACTED TEETH

Dahlgren's method[4] of preparing teeth was used in this phase of the work. Ten different materials commonly employed in root canal sterilization were tested. Twenty autoclaved teeth were used for each substance tested, and two strains of streptococci were used: the gamma strain from Case 9 and the alpha strain from Case 19. The cultures were grown in serum broth for forty-eight hours and introduced into the sterile canals by sterile capillary pipets. The canal was replugged with sterile nonabsorbent cotton and incubated in a moist chamber at 37 C. This inoculation was repeated three times at intervals of about a week. After the third inoculation, cultures were made from the canals, and when all canals showed viable streptococci, sterile cotton points saturated with the materials to be tested were placed in the canals. After replugging, they were incubated in the moist chamber for forty-eight hours. Cultures were then made from the canals to serum broth, and incubated for forty-eight hours. At this time, slides were made of each culture and the presence or absence of streptococci was recorded.

The lower right hand graph in Figure 12 is a graphic presentation of these results. It is rather interesting that the materials that lead in Part II also lead in Part III with the exception of tincture of iodin. It will be noted that a similar curve is made by both strains used, but because of the individual resistance of the strains against certain materials, one curve is more rugged than the other. This checks very well with the results of Part II, and more closely with the results found *in vivo* (Part I), but it has not been carried far enough to more than indicate probabilities.

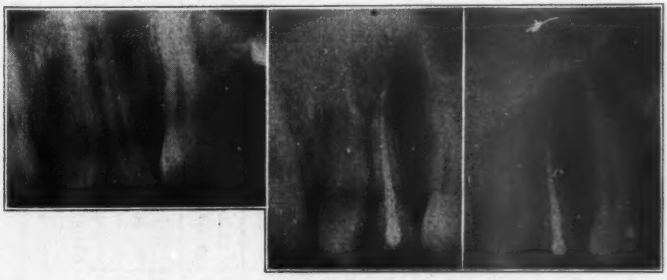

Fig. 7 (Case 6).—Left, appearance of tooth at time of pretreatment (April 26, 1928); when filled (May 25, 1928); six months later (Oct. 12, 1928).

SUMMARY OF RESULTS

1. Solution S.T. 37 has failed to give negative cultures when used in root canals even over long periods of time. It also failed to destroy organisms ob-

4. Dahlgren, B. E.: Study of Efficiency of Disinfectants and of Ionization of Root Canals of Infected Teeth, J. A. D. A., 4: 241-246 (March) 1917.

TABLE 3.—BACTERICIDAL EFFICIENCIES AGAINST VARIOUS TYPES OF ORGANISMS.

Organisms	No. of Strains	Solution				Dichloramin S. T. 37				Sodium Ricinoleate 2 Per Cent				Sodium Ricinoleate 40 Per Cent				Formocresol				Ammonical Silver Nitrate				Ammonical Silver Nitrate and Formalin			
Time (minutes)		15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405
Alpha streptococcus	7	14	43	57	86	14	14	43	71	0	0	0	* 33	0	14	14	30	57	57	71	100	0	0	0	14	43	100	100	100
Beta streptococcus	5	60	80	80	100	20	60	80	100	Ones only				0	20	80	80	60	60	60	60	0	0	0	0	60	100	100	100
Gamma streptococcus	4	25	50	50	75	0	25	75	100	0	33	33	* 33	0	25	25	25	75	100	100	100	0	0	0	0	50	75	100	100
All streptococci	16	31	56	63	88	13	31	63	88	0	14	29	‡ 43	0	19	38	50	63	69	85	88	0	0	0	6	50	94	100	100
Staphylococcus albus	11	55	64	82	100	55	73	82	100	33	67	67	* 67	9	20	45	55	45	45	45	64	9	9	27	27	55	100	100	100
Bacilli	5	0	0	0	40	0	0	0	20	0	50	50	‡ 50	0	20	20	20	20	60	60	100	0	0	20	20	40	80	100	100
All strains	32	34	50	59	84	25	44	63	81	8	33	42	* 50	* 3	13	38	47	50	59	63	81	3	3	9	16	50	93	100	100

TABLE 3.—BACTERICIDAL EFFICIENCIES AGAINST VARIOUS TYPES OF ORGANISMS—*Continued*

Organisms	No. of Strains	Beechwood Creosote				Tincture of Iodin				Alcohol 95 Per Cent				Osogen Fluid				Cresatin plus Benzene				Magnesium Chlorid			
Time (minutes)		15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405	15	45	105	405
Alpha streptococcus	7	14	14	86	100	86	100	100	100	60	80	80	†100	100	100	100	*100	0	0	0	‡0	50	100	100	‡100
Beta streptococcus	5	40	40	60	100	60	100	100	100	50	75	75	¶100	100	100	100	¶100	Only strain				Only strain			
Gamma streptococcus	4	25	50	100	100	100	100	100	100	Only strain				100	100	100	*100								
All streptococci	16	25	38	81	100	81	100	100	100	60	80	90	§§100	100	100	100	##100	0	0	0	0	*33	100	100	*100
Staphylococcus albus	11	45	64	100	100	73	91	91	100	62	88	88	#100	100	100	100	§100	0	0	0	‡0	100	100	100	‡100
Bacilli	5	0	0	60	80	40	80	80	100	0	25	50	100	100	100	100	‡100	0	0	0	‡0	100	100	100	‡100
All strains	32	28	41	84	97	72	93	93	100	50	73	82	††100	100	100	100	‡‡100	0	0	0	##0	86	100	100	##100

*Three strains †Five strains ‡Two strains ¶Four strains #Eight strains §Six strains **Twelve strains
††Twenty-two strains ‡‡Nineteen strains ##Seven strains §§Ten strains

tained from putrescent canals when placed with them in test tubes. It failed entirely to sterilize extracted teeth in one case and gave but 40 per cent efficiency with a different organism in later tests.

2. Although not so rapid in its action as osogen fluid, formocresol and some of the other irritating disinfectants, beechwood creosote has proved quite consistent in its ability to destroy the organisms of putrescent canals.

3. Unquestionably no anaerobic forms were found in putrescent canals.

4. Closing a canal with temporary filling material after moistening the pulp chamber with oil of cajuput proved effective in sealing it perfectly from outside contamination.

Fig. 8 (Case 7).—Left to right: Appearance of tooth at time of pretreatment (April 25, 1928); when filled (May 21, 1928); six months later (Oct. 16, 1928); thirteen months later (May 24, 1929).

CASE REPORTS

CASE 1.—A white man, aged 30, had a roentgenographic examination of an upper right central incisor, which revealed that the apical area was almost normal. Pretreatment cultures yielded a gram-positive streptococcus and a gram-negative bacillus. Eight treatments with S. T. 37 were given, covering a period of twenty-eight days. At each treatment, the cultures yielded the same organisms. Although, at the time of filling, a negative culture was obtained, the fact that only one culture was negative makes the sterility of the canal questionable. This is the only case in which a negative culture was obtained during treatment with S. T. 37.

CASE 2.—In a white man, aged 21, the upper left central incisor showed a slight apical rarefaction. The canal had been filled previously and the presence of iodoform was apparent on removal of the filling. Six treatments with beechwood creosote were applied during a period of twenty-five days. Six negative cultures were obtained. Roentgenograms showed an improved apical area.

CASE 3.—A white man, aged 23, presented a small rarefied area at the apex of the upper left central incisor. The pretreatment culture yielded a gram-positive streptococcus. In subsequent cultures, a gram-positive staphylococcus also appeared. Ten treatments with S. T. 37 during a period of forty-nine days failed to modify the infection. During the next twenty days, six treatments with beechwood creosote yielded one negative culture. As patient was tiring of the treatment, the canal was filled. Roentgenograms taken from time to time show a gradual filling in of the rarefied area.

CASE 4.—In a white woman, aged 27, the upper right lateral incisor showed a slight apical rarefaction. The crown was badly broken down. Pretreatment cultures contained a gram-positive staphylococcus, which was persistent throughout the treatment. Seven treatments with S. T. 37 during thirty-two days, followed by three applications of dichloramin T during the next thirteen days, yielded no negative cultures. The canal was

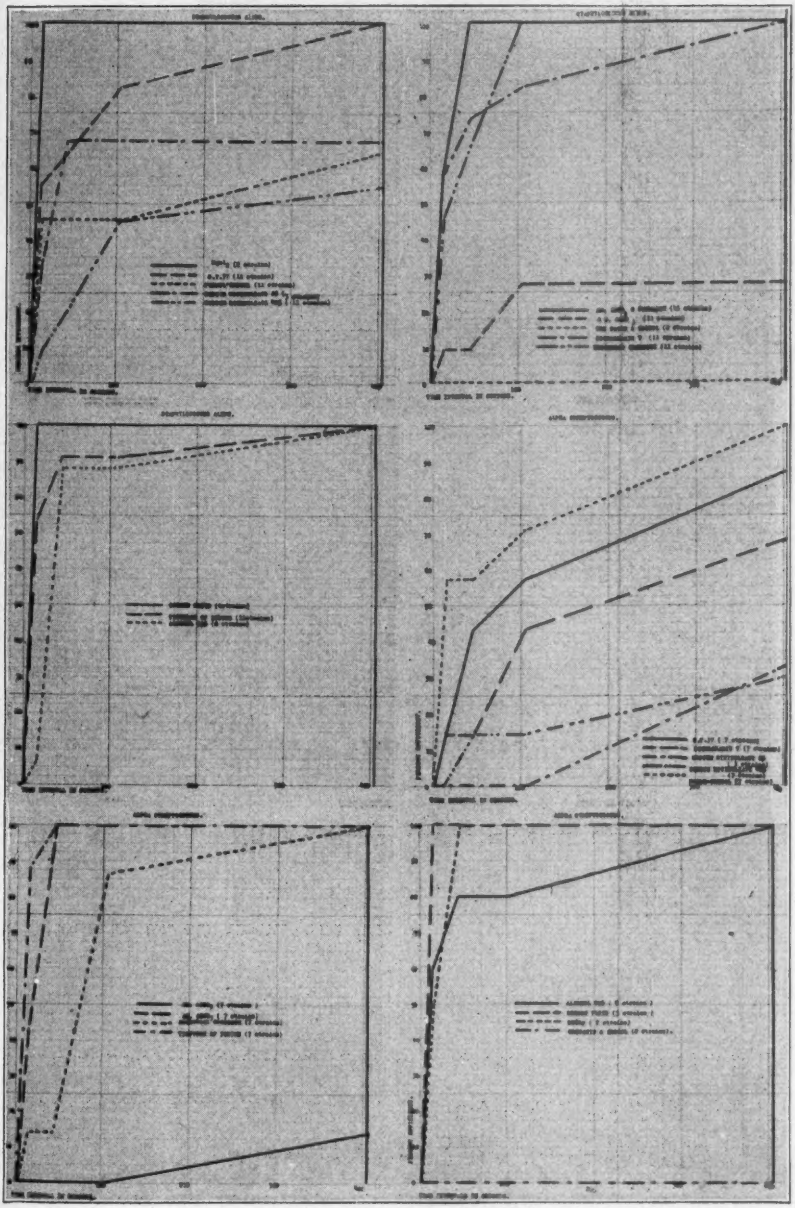

Fig. 9.—Experimental graph.

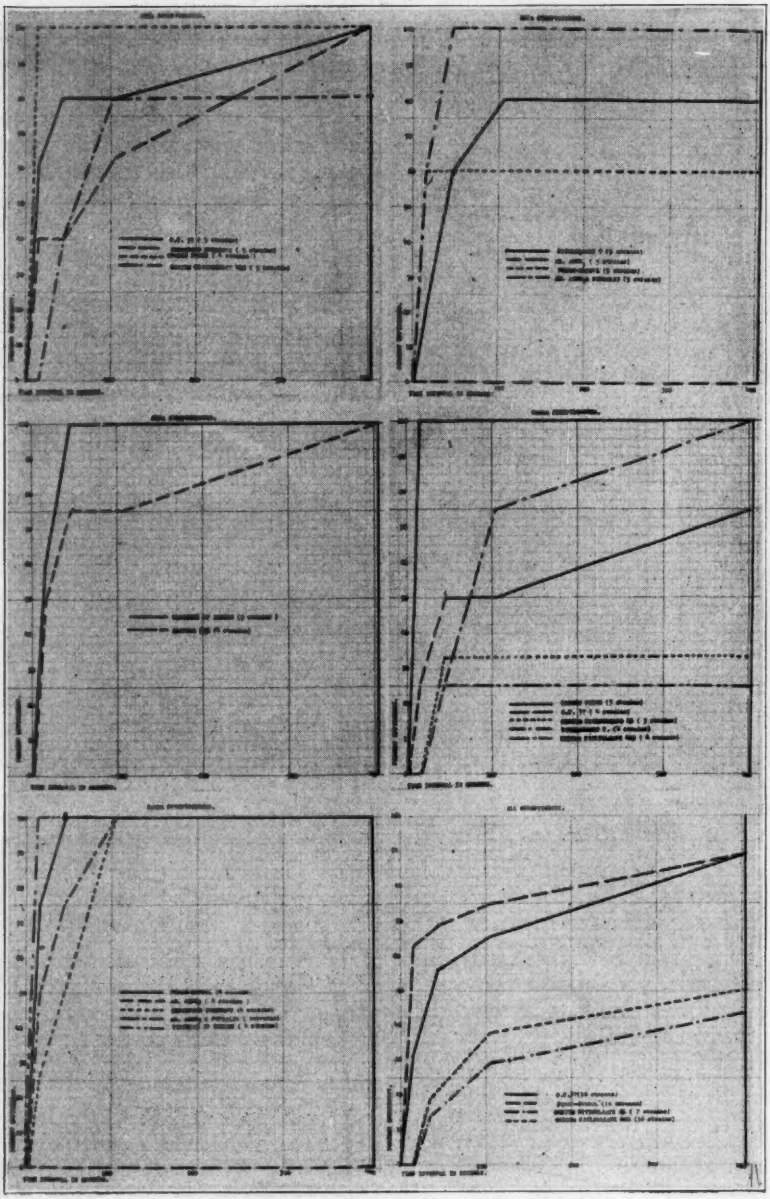

Fig. 10.—Experimental graph.

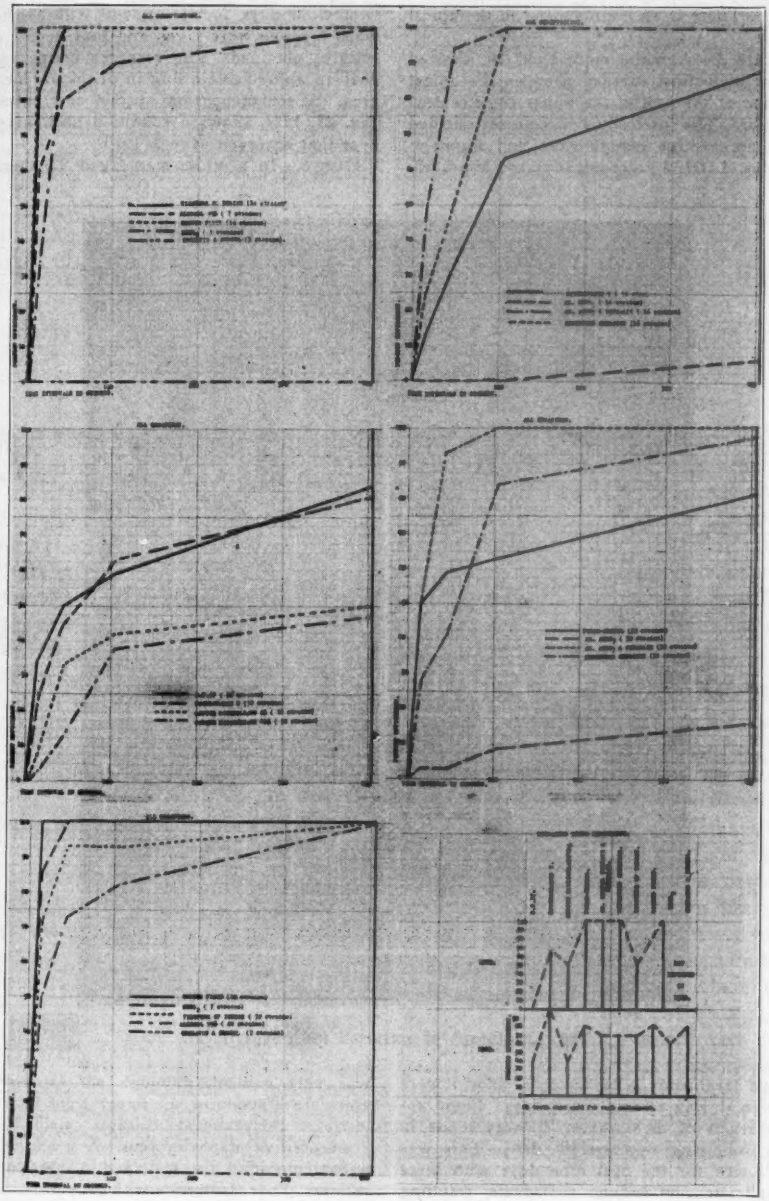

Fig. 11.—Experimental graph.

filled. There is an improvement in the apical area.

CASE 5.—A white man, aged 30, showed a large, distinct rarefied area on the apical 3 mm. of the root of the upper right central incisor. The pretreatment cultures yielded a gram-positive streptococcus and staphylococcus. Later, a gram-negative rod appeared. Five treatments with aqueous chlorin were given during twenty-seven days. Eight applications of dichloramin T were made in the following twenty-eight days. This was followed for the next nine days with three applications of sodium ricinoleate, resulting in one negative culture. During the next twenty-one days, four treatments with beechwood creosote were given and four negative cultures obtained. The roentgenograms reveal an appreciable filling in of the rarefied area. A roentgenogram of this case taken Jan. 23, 1931, shows a condition unchanged over that observed May 2, 1930.

CASE 6.—In a white man, aged 22, there was very evident, although not extensive, apical rarefaction of the upper right lateral incisor. Pretreatment cultures yielded a gram-positive staphylococcus. A gram-positive streptococcus also appeared in subsequent cultures. Four treatments with sodium ricinoleate were given during eleven days. During

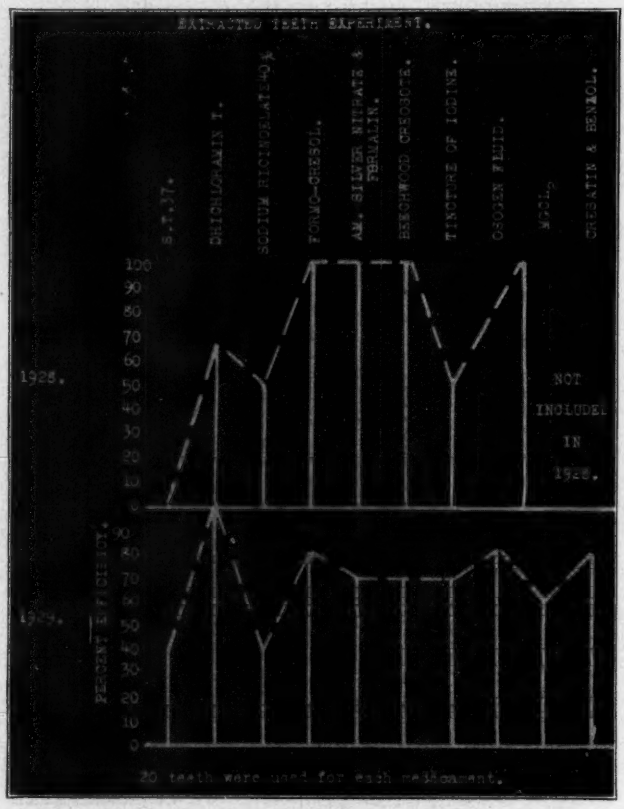

Fig. 12.—Graph of extracted teeth experiment.

the following eighteen days, five treatments with beechwood creosote were applied. Five negative cultures were obtained during this period. There is distinctly less rarefaction in the apical area.

CASE 7.—In a white man, aged 20, there was a distinct apical rarefaction, involving the apical 3 mm. of the root of the upper right lateral incisor. Pretreatment cultures yielded a gram-positive staphylococcus and a streptococcus. Later, a gram-negative rod appeared. During the first twelve days, four treatments with sodium ricinoleate were applied. This was followed with six applications of beechwood creosote over a period of fourteen days. The canal was filled before negative cultures were obtained. There is an appreciable filling in of the rarefied area.

NITROUS OXID-OXYGEN VS. LOCAL ANESTHESIA FOR MINOR ORAL SURGERY*

By JOHN W. SEYBOLD, D.D.S., Denver, Colo.

MY belief that gas oxygen anesthesia is a superior anesthetic for minor oral surgery and exodontia, is not due to inability to apply nerve block or local anesthesia successfully, for as you may know I was one of the first in this country to use it, and I still use it on request when patients are referred to me and when my own patients express a preference for it.

That gas oxygen general anesthesia is my preference will be shown in discussing (1) indications for a general anesthetic; (2) advantages of a general anesthetic; (3) technic of its application; (4) disadvantages, and postoperative results.

INDICATIONS

A general anesthetic is indicated for all patients of a nervous, hysterical type and for patients who have had a previous painful experience and are in a near state of collapse. Expectant mothers should have the benefit of a skilfully administered general anesthetic, in order to avoid bringing on an abortion. All patients under the age of 15 years should be given nitrous oxid and oxygen, as a painful experience at this time may ruin the child as a patient for the rest of his life.

ADVANTAGES

The advantages of a general anesthetic are as follows: 1. It is far more pleasant for the patient. 2. When properly administered, there are no after-effects. 3. We do not have the disagreeable numbness and trismus common to nerve block anesthesia. 4. We do not have to argue and constantly assure the patient that we will not hurt him. 5. Mental shock is eliminated entirely with a general anesthetic properly administered. Clay says, "In cases where the patient is a poor surgical risk because of cardiac, kidney or lung lesions, or a desperate septic state, nitrous oxide oxygen is better tolerated than ether or even local anesthesia." 6. Last, but not least, twice the number of patients can be taken care

*The papers of Drs. Seybold and Miller were presented as a symposium.

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 22, 1930.

of in a given length of time than can be cared for by using nerve block anesthesia.

TECHNIC

A good technic in the administration of an anesthetic is all important. It is conducive to ideal operative conditions and a pleased patient. A bad or faulty technic frightens the patient; the operative work is made difficult, and the patient refuses to take a general anesthetic ever after. Nitrous oxid and oxygen is the anesthetic indicated in minor oral surgery and exodontia because it is the safest of all known general anesthetics. It is not explosive or inflammable. It is quick in action and pleasant to take and anesthesia can be maintained for hours if necessary. The patient will return to normal within a few minutes, and can leave the office. Occasionally, there will be some nausea, but this is due to the patient's swallowing blood; or perhaps the anesthetic has been improperly administered.

A good technic is not possible unless the anesthetist is thoroughly grounded in anesthetic symptoms, such as pupillary reflexes, general muscular phenomena and respiration, and is an acute observer of color changes. These symptoms are all definite guides as to the patient's condition and requirements for a safe anesthesia.

Next in importance is the approach. To win the patient's confidence, we may address her somewhat as follows: "This will be a pleasant experience, and I want you to keep your eyes open as long as you can, for you get off in the dark and lose confidence if you close them. First, you will smell oranges, and then a pleasant glow will pass over you. As you get sleepy, you will hear music and drift off to sleep. When you awaken, I am going to ask you whether I have told you the truth."

The nurse, seemingly accidentally, lightly touches the tip of the patient's nose with her finger, which has been wet with oil of bitter orange peel. The nose mask is gently laid over the nose, and the patient smells oranges, yet is breathing a light flow of nitrous oxid, about 3 gallons a minute.

The patient is now asked to open the mouth and a mouth prop is placed, with the request to breathe in any way that is comfortable. In about a minute or two, the pleasant glow promised is experienced. We have gained the patient's confidence. The mouth cover is gently applied and valve opened so that the patient is now getting gas by both nose and mouth. Here, we turn on a concealed phonograph. The nasal inhaler is now secured in place and sterile drapes arranged. Next, the exhaling valve is adjusted so that the breathing bag is nicely rounded but shows the respiration. If respiration has started by being too light, carbon dioxid 5 per cent is immediately added to deepen it. If respiration was and is normal, no carbon dioxid is necessary.

By this time, we are able to classify our patient as a susceptible or resistant type, and the flow of nitrous oxid is lowered or raised as the case demands. Next, the eyelid resistance is tested, and thereafter the pupillary reflex is our signpost, together with the eyeball movements or position. When the proper depth of anesthesia is obtained, the depth that we personally prefer, 7 per cent oxygen is added and pupillary reflex, respiration and general condition of the patient are observed. I like to see a stationary eyeball in centric position with a small pupil. This indicates deep surgical anesthesia, the ideal condition for the operator. It is

obtained by a correct flow of nitrous oxid for that individual patient, together with proper oxygenation. The latter may mean 7 per cent oxygen for one patient, while another will require 20, and some may require a great deal more, because of a pathologic condition of the blood stream.

When the pupillary condition is as mentioned above and the respirations are regular, the color and general condition closely simulating natural sleep, I am ready to operate.

The mouth cover is removed and its valve closed. The throat is packed with sterile gauze sponges with a cotton core. Oxygen is added and the percentage required determined. We then sponge the face with alcohol and prepare the field of operation. After the operation is completed, the throat packs are pulled forward slightly, the anesthetic is stopped, the inhaler removed and the patient allowed to return to normal slowly. As signs of returning consciousness are noted, we say, "Good morning, are you ready for breakfast? Did you have a good sleep?"

DISADVANTAGES

One of the disadvantages of a general anesthetic lies in the fact that it requires a greater degree of skill than is the case with nerve block. It cannot, or at least should not, be given to a patient who has not been properly prepared. A nauseated patient is not a pleased patient.

It should never be given to a patient with Ludwig's angina or to one who has a cystic growth of the throat which is liable to break into the airway and flood the lungs.

Being a true anesthetic, it can produce death when improperly administered. Therefore, it is not fool-proof. But neither is procain safe or fool-proof. Deaths have resulted following its use.

POSTOPERATIVE RESULTS

The postoperative results following general anesthesia have in my practice been far superior to those obtained when nerve block was used. There has been less postoperative pain and discomfort, and many times no medication was necessary, even though all the teeth were removed in one operation. I have noticed that there are very much better blood clots, which remain to protect the area operated on, and the wound heals more quickly. There is far less mental shock under a general anesthetic than is the case with deep nerve block. Patients as a rule declare that they will have no more nerve blocking now that they know that this method is available.

LOCAL ANESTHESIA VS. NITROUS OXID-OXYGEN IN MINOR ORAL SURGERY*

By HOWARD C. MILLER, D.D.S., F.A.C.D., Chicago, Ill.

THE selection of the anesthetic to be employed in any operative procedure is most important. It rests with the judgment of each individual operator as to how he can best serve his patient and assure the most satisfactory end-results. No one anesthetic is suited for all cases nor for all operations, and it is unjust to condemn the use of any method as an improper procedure simply because one has a decided preference for another method. The successful operator selects the anesthetic best adapted to the case and the one through which the patient will receive the greatest benefit from his services.

Dr. Seybold has brought out many points in favor of this valuable anesthetic, and has been very broad in his attitude toward local anesthesia. It is my object to show the value of local anesthesia in the field of oral surgery and exodontia, not with the idea of attempting to indicate a decided preference for this method over general anesthesia, but to point out its outstanding advantages.

Local anesthesia in its various forms comes to us with a rich inheritance of usefulness and success, not only in oral surgery but also in the field of general surgery, where it has been employed for years by men who are skilful and who believe that many patients are better operated on under local than under general anesthesia. Though local anesthesia is extensively used with almost complete safety and success, the responsibilities even in a procedure so apparently simple are just as great as in the use of general anesthesia, and should never be minimized.

The use of local anesthesia dates back to the perfection of the hypodermic syringe by Alexander Wood in 1853, following the unsatisfactory use of a syringe invented in 1845. From that time to the present, much progress has been made in its use, especially since the isolation of the active principle of the suprarenal gland by Takamine and Aldrich, in 1901. Prior to that time, the extensive use of cocain had resulted in many fatalities on account of its rapid absorption and toxic effect, which has now been greatly reduced by its combination with the newly discovered suprarenal extract. Even in this form, cocain as a local anesthetic was far from satisfactory, and continuous effort was made to perfect a product which would be less toxic than cocain and still resemble it in anesthetic action.

The most satisfactory product among the several substitutes discovered is "novocain," the American product being known as procain, which was compounded and presented to the profession by Einhorn in 1905. This product has been in continuous use as a local anes-

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 22, 1930.

thetic in combination with a vasoconstricting agent since that time, and it is today considered the safest of local anesthetics when properly employed.

Recently, several reports have been made on the clinical use of ethocain borate as a local anesthetic in dental operations, and according to those who have compiled these reports, this product is much less toxic than procain; the resulting anesthesia is obtained much more rapidly and is equally profound but of slightly shorter duration than with procain in the same quantity and with the same technic of injection; there is no local postoperative pain associated with its use, and it can be combined with a vasoconstricting agent to produce a satisfactory local anesthesia. The clinical use of ethocain borate will necessarily have to be much more extensive before it can be considered as valuable a local anesthetic as procain.

A patient, on presentation for the services of the oral surgeon and exodontist, is entitled to, and should receive, the following considerations: (1) diagnosis, which should be complete, a decision being reached only after the employment of every possible means of diagnosis is at the disposal of this specialty at the present time; (2) selection of the anesthetic; (3) operative procedure, and (4) postoperative care. When careful consideration of these four essentials is given each case, the selection of the form of anesthesia may be made much more judiciously, and the patient will receive the greatest benefit.

The decision as to what anesthetic is to be employed should be based upon the physical condition and temperament of the patient, the type of operation and the personal choice of the one making the selection.

Many times, patients are referred to an oral surgeon or exodontist by a general practitioner with explicit orders to remove certain teeth or perform an operation under a specified anesthetic; a procedure which may often result in embarrassment for the specialist, especially if his choice differs from the one advised. In such cases, the patient should receive the first consideration, and if the operator believes that the patient's interest can best be served by employing a certain anesthetic, it is his duty to so advise his patient in terms that are most convincing, in order that the result of the operation may be all that is desired.

Probably, the necessity for such advice becomes more imperative when employment of a local anesthetic is decided on over the preference of the patient for nitrous oxid-oxygen; this preference, as a rule, having been instilled by the referring dentist, or being the result of an unhappy experience with local anesthesia. Some friend or relative may have had a long period of postoperative discomfort which had been blamed on a local anesthesia; or many other factors may enter in with which you are all familiar.

In such a case, it is necessary to present convincing reasons for your selection of a local anesthetic. Primarily, there is the fact that, under nitrous oxid-oxygen, especially when employed in an office, there is a tendency to hurry the procedure more than under a local anesthetic; not that the patient cannot be kept under the influence of the anesthetic for a sufficient time, but because we all have a wholesome respect for an unconscious patient, and it is the desire of the operator to complete the case and restore the patient to consciousness. Further, there is a lack of cooperation on the part of the patient during operative procedure; and there may be interference in the field

of operation in certain types of cases by the nasal inhaler, throat packs, etc., and, unless the office is equipped with an aspirating apparatus, by bleeding of the parts. If the operator is sure from his clinical experience that these statements are true, it is not a difficult matter to convince the patient that the selected anesthetic will result in the greatest benefit to him.

It then becomes necessary to pursue a course by which all the statements made will be fulfilled, both by proper completion of the case without pain and by the consideration shown the patient during operation. The majority of patients so cared for invariably prefer the use of a local anesthetic, even if a previous experience has been unsatisfactory.

In the early days of local anesthesia, pressure was considered essential to success. For this reason, many operators continue to deposit the anesthetic solution in the dense surrounding gum tissue under considerable pressure, which is the cause of much postoperative discomfort and considerably more primary pain. Injection made slowly and with only sufficient pressure to discharge the solution into the soft tissue along the mucobuccal fold, or at the entrance or exit of the nerve trunk from its bony canal, will prevent many of the unfavorable sequelae of the solution's being deposited in the more dense surrounding tissues.

To compare so-called infiltration and deep block as being different methods of producing local anesthesia is not strictly accurate. In one, the solution is deposited in or around the operative field, and, in the other, it is deposited at some distant point from the field of operation; while, in each method, anesthesia is produced by the infiltration of the nerve endings and nerve trunk by the anesthetic solution. There is no attempt to deposit the solution directly in the nerve trunk in blocking the branches of the fifth cranial nerve.

There are those who object to the use of local anesthesia on the ground that it interferes with the circulation and causes many of the violent reactions seen following the removal of teeth; that it causes unnecessary pain and swelling, and that the blood clot more often breaks down and disintegrates, so-called dry socket resulting. It is true that serious reactions have occurred after the use of local anesthesia, but as a rule when one of the fundamental principles of any surgical procedure has been violated—the maintenance of scrupulous asepsis throughout the procedure.

It is an unhappy truth that many operators give too little attention to the proper care and sterilization of syringes and needles, both before and during their use, are careless in the preparation of the solution and give no particular thought to the conditions surrounding the patient and to disinfecting the area of injection. Great care must be taken to avoid injection into an acutely inflamed or infected area. Any case presenting evidence of a superficial infection, such as acute Vincent's infection, must be under control before any operative procedure is attempted. Any form of acute ulcerative gingivitis or severe infection around unerupted or impacted third molars should be carefully treated and under control before operation, as the danger of spreading infection is great, especially in the region of the lower third molar.

It is not always necessary to treat these conditions for a long period, but, after a few treatments, the tissues will be better able to protect themselves against the invasion of bacteria which results from the trauma produced by operation.

In dealing with the acute type of dental infection, such as acute alveolar abscess, great care must be employed in the use of a local anesthetic, as even in the early stages of anesthesia the extent of tissue involvement and the virulence of the organism is an unknown factor.

The objection to local anesthesia because of the presence of a vasoconstricting agent which interferes with circulation is unfounded. The amount of this agent present in a properly prepared solution is small, and its action is only for a short period of time, following which there is a period of hyperemia, which is manifested by a more profuse bleeding within an hour or more after removal of a tooth. This objection, therefore, is unjust, and it is usually necessary to consider other conditions as the causative factor in such reactions.

The question of postoperative pain varies in different persons. It is governed by the physical condition of the patient, the amount of infection present, the amount of surgical trauma necessary to eliminate the pathologic areas, and to a certain extent, the use of the local anesthetic, when one is employed. The solution itself and the manner of injection are factors of importance. The solution should be properly prepared and should contain the smallest amount necessary of the vasoconstricting agent (epinephrin); it should be injected slowly, only sufficient pressure to discharge it being used, and should be near body temperature. Each of these conditions influences the amount of postoperative pain.

In all cases, there is a period of absorption after the action of the vasoconstricting agent has passed away, this action varying from forty-five minutes to an hour and a half, depending on the amount in the solution injection. There is a dilatation of the vessels and an increase in the blood supply to the part, dilatation being due to the compensatory action of epinephrin, which always manifests itself in a hyperemia of the part following its use. This period of absorption lasts from two to five hours, during which time the injected solution is completely absorbed, provided it corresponds in action as nearly as possible to the physiologic action of the living tissue cells. While absorption is taking place, the patients may experience some discomfort and soreness, but if they have been warned of this, and if proper directions have been given to combat the discomfort, they will minimize the amount and in many cases will report that no pain was experienced.

The causes of swelling when due to the use of a local anesthetic are: the rupturing of a small blood vessel by the insertion of the needle, which allows its contents to escape into the surrounding tissues; too rapid injection, which may cause ballooning or distension of the tissues, and the use of dull needles and careless manipulation of the syringe, which may traumatize the tissues unnecessarily and produce an excessive swelling.

Other causes of swelling which are sometimes attributed to the use of a local anesthetic are: undue trauma in the removal of teeth, the spreading of infection either by injection through an infected area or by the improper handling of infected cases, destruction of nerve fibers by curettement, with resultant prolonged anesthesia, and other operative procedures the responsibility of which is unfairly placed on local anesthesia.

The question of disintegration of the blood clot and the production of the so-called "dry socket" is a difficult one. This is possible in general anesthesia as well as local. The operator should, as far as possible, prevent the entrance of

saliva into the socket or wound; prevent excessive trauma, exposure of the alveolar process for too long a period, with rough sharp edges of bony process remaining; eliminate all pathologic areas, and close the socket or wound in order to protect as far as possible all exposed or denuded bone.

After operation, the patient should be instructed not to rinse the mouth vigorously, and proper instructions should be given as to the after-care and as to the importance of returning for treatment. Such care many times will keep the patient comfortable through a period which might not be so if they are neglected. When the patient returns for treatment, the "dry socket" may be anticipated after the first day or so, and proper treatment instituted to protect the exposed nerve ending until Nature has had sufficient time to supply the necessary covering.

The toxic symptoms and syncope which occasionally result from the injection of a local anesthetic have caused some objection to its use. Many of these manifestations are due, when a properly prepared procain-epinephrin anesthetic solution is used, to too rapid injection; injecting the solution directly into the blood stream, or injecting with the patient in an upright position in the dental chair. All injections should be made slowly, with as much care as possible, to avoid depositing the solution in an artery or vein, and with the patient in a reclining or semi-reclining position; all of which will assist in preventing many of these unfavorable reactions.

On the appearance of toxic symptoms —pallor, tremor, profuse perspiration or excessive nervousness—the use of aromatic spirits of ammonia, either internally in a small amount of water, or placed directly under the tongue by means of a medicine dropper, will do much to overcome the condition and prevent syncope. Psychotherapy also will do much to lessen the symptoms and will help the patient to regain control of himself and continue normally through the operation.

The successful use of local anesthesia involves the careful application of its fundamental principles in each case, and has as its basis careful diagnosis, scrupulous asepsis, the use of proper anesthetic solutions and an exact technic and a thorough knowledge of anatomy.

55 East Washington Street.

DISCUSSION

J. Holden Beckwith, Miami, Fla.: I disagree with Dr. Miller when he says that the choice of an anesthetic should be decided by the physical and nervous condition of the patient. I believe in the average case that the decision should be made on the basis of the comfort of the patient and the ability of the anesthetist. I also believe that a dentist, or an exodontist who has not fairly mastered the technic of administering nitrous oxid-oxygen, should not choose nitrous oxid-oxygen, but an anesthetic the administration of which he understands. If he has not taken a special training in nitrous oxid-oxygen anesthesia, he should practice conductive anesthesia. But if we are to consider the condition of the patient and will take time to study the technic, there will be less shock to the patient under nitrous oxid-oxygen anesthesia. Less postoperative treatment will be necessary. If Dr. Miller and Dr. Seybold keep a record of patients who have had an experience with conductive work they will find that a second time they will ask for nitrous oxid, saying, "I had an unpleasant experience with a needle, either from shock or from pain." If they will also take a record of the patients who say, "I had nitrous oxid-oxygen before; I prefer conductive anesthesia this time," they will learn if they check up on the anesthetist who gave the nitrous oxid, that there was something wrong in his technic. I am a strong advocate of nitrous oxid-oxygen, for the comfort of the patient and the beautiful results. We want what has been satisfactory to us, and the popularity of nitrous oxid-oxygen anesthesia in the past few years over the local anesthesia of a few years ago has proved

that the average American prefers nitrous oxid-oxygen.

M. Hillel Feldman, New York City: I do not feel as many exodontists feel that a referring dentist is somewhat presumptive, or that the patient who comes to the exodontist is equally presumptive, when expression is made of a preference for general anesthesia for the particular operation for which the patient has come to the exodontist. When such an expression is made, they are within their rights, because that service can be rendered under general anesthesia. The only presumption I find is on the part of the exodontist or oral surgeon who immediately begins to belittle the choice that is made by the referring dentist, or by the patient, and who makes remarks which are derogatory to general anesthesia and to the things which can be done and are daily being done under general anesthesia. I take every opportunity to emphasize that general anesthesia can afford the operating dentist every facility for perfect technic, even as regards sterility of the area on which we are operating, that local anesthesia can afford. But before skill in technic under general anesthesia can be developed by the operator he should perfect himself in the technic of exodontia under local anesthesia. Finesse of technic cannot be attained by a man who operates under general anesthesia without first perfecting himself in the principles of local anesthesia. If a man knows exactly what he is to do and develops a definite plan beforehand, he can accomplish under general anesthesia the removal of the most deeply imbedded roots or impacted teeth or the enucleation of cysts. It is somewhat unfortunate that in the presentation of this symposium any intimation has been given of a debate. There has been no debate. Dr. Seybold has outlined an excellent technic for use under general anesthesia, and Dr. Miller has outlined an excellent technic for use under local anesthesia. As for myself, I employ general anesthesia in the major portion of the work referred to me.

Dr. F. E. Jeffrey, Salem, Mass.: There is one thing that has been overlooked in the discussion. In New England, if we are working under gas-oxygen, we have to consider the weather. We are not fortunate enough in New England to do all of this work in a hospital, and when we come to administer gas-oxygen in the dead of winter with the thermometer around zero, it is unfortunate if an operation that you think is going to take three or four minutes takes perhaps a half hour. How long will it be before we can allow the patient to go home? What about breathing the cold air into the lungs with the nitrous oxid and oxygen? Then, oftentimes, we have only one rest room, and if we have two chairs, it is rather hard to take care of the cases. Dr. Beckwith said that nitrous oxid was given much more frequently than procain. This is not true of New England; it may be so in Miami. Most of the general practitioners have no gas-oxygen machine and they are doing their work under procain. I think that almost anything can be handled under procain, although I will say that the anesthetic in the handling of which the practitioner has been educated is the one he can get the best results with. With my ten years' experience in exodontia, if a patient with a deeply impacted tooth insists on having nitrous oxid I refer him to a man trained in the use of it.

George Schneider, La Salle, Ill.: If Dr. Seybold were to eliminate either local or general anesthesia, I surmise that he would eliminate the local. If Dr. Miller should eliminate one, he probably would hesitate, and it is very certain that the dental profession, and the medical profession, as well, needs both.

Nye White Goodman, Los Angeles, Calif.: It seems to me that neither this body nor any other will ever come to the point of deciding which anesthetic—nitrous oxid or a local anesthetic—will become universally used. If every man in this room were to attempt to give nitrous oxid to every patient who came to his office, there would undoubtedly be more fatalities today than if every man in this room would attempt to give a local anesthetic to every patient that came into his office. Only a small percentage of dentists are practicing exodontia. Every general practitioner of dentistry today should know the technic of local anesthesia. It is not so important that our general practitioners today know the technic of general anesthesia, because the majority of surgical and similar work is referred. I do not see that there is any debate on this question at all; but I do believe that a proper technic in the use of procain or cocain today is something that every individual who is practicing dentistry should be familiar with. First, it is necessary that the individual become familiar with the human anatomy. Any-

one attempting to make a local injection without knowing anatomy and the condition of the tissue in which he is making this injection has no right to make the injection. I have seen many a man inject a local anesthetic into an infected area, and wonder why the results were not favorable. A thorough technic in nerve blocking and local anesthesia is one of the most valuable assets of the dentist in general practice or in the practice of exodontia.

Dr. Seybold: This was no debate. I merely wanted to present the subject in a way to bring out the opinions of the section. I do not want to belittle either method. I am merely saying this: I am thinking of the mental aspect of the patient, and I would say this: Let us be masters of both methods, and then use either one that the patient likes. About the anesthetic in the winter; we have to operate in the winter just as other surgeons do. We should be equipped to take care of our patients. We have the outer clothing removed, and supply the woman patient with a gown before operating. Afterwards, they put on their outer clothing and go out on to the street in perfect comfort. We cannot pay too much attention to the patient. If you have been a patient, as I have been, in the hospital, you will have a different point of view. We should not make any comparison of the anesthetics; we should master them. Dr. Goodman says that it is more dangerous to use nitrous oxid-oxygen than it is to administer conductive anesthesia. Let us not forget that patients have died under local anesthesia as well as under general. Neither one is "fool proof."

Dr. Miller: It was the intention of the program committee that these two papers be presented in the form of a symposium on the merits of local and general anesthesia in oral surgery and exodontia. In view of the value of each to this branch of dental science, the subject does not lend itself to debate, although the trend of discussion has been somewhat toward that end. My presentation apparently created some impression that I employed no anesthetic but local in my practice, which was far from my intention in the preparation of this paper. As I stated before, the selection of the anesthetic is most important and it should rest with the judgment of the operator as to how he can best serve his patient and bring about the most satisfactory end-results, based, of course, on the physical condition and temperament of the patient, the type of operation and a thorough knowledge of the value of the various forms of anesthesia, with the thought that no one anesthetic is best adapted to all cases. Dr. Beckwith, in referring to his own records of patients, stated that the majority showed a preference for general rather than local anesthesia. This is determined by the routine practice of that office and is based upon the results which Dr. Beckwith has obtained. He undoubtedly prefers a general anesthetic and can obtain a correct end-result thereby, and this again bears out my statement that the selection of the anesthetic rests with the operator, on the basis of his clinical experience and judgment. In my own practice, a number of patients who have had experience with both general anesthesia and nerve blocking have expressed a preference for local anesthesia. I believe therefore that it is difficult to base a conclusion entirely upon the opinion and reaction of your patients. In young children, in highly nervous neurotic patients, in patients suffering from acute infections, and in other similar types of cases, there is no question that general anesthesia is the anesthetic of choice. Many such cases have been handled by general practitioners under local anesthesia, with disastrous results. Personally, in those cases in which general anesthesia is indicated, and in which I know the procedure will be lengthy, I make every effort to hospitalize the patient, so that he may have the benefit of the preoperative and postoperative care which is there available. Dr. Feldman referred to the right of the patient to select his anesthesia. I agree that the patient's preference should be considered, all things being equal, but only if the operator is satisfied that he can carry the case through to a proper conclusion under this type of anesthesia. If he believes the case better adapted to some other form of anesthesia, it is his duty to so inform the patient and to select the anesthesia by which he is confident he can obtain the best result. The fact must not be overlooked that when one undertakes any operative procedure, it becomes his responsibility, and he should not allow himself to be persuaded against his better judgment to use a form of anesthesia which may complicate the situation to the extent that he is unable to bring about a result which is satisfactory to him. Dr. Seybold mentioned the importance of the con-

sideration of psychic disturbance and the reaction of the patient to surgical procedure, and has referred to office management. I am sure many of us are familiar with the procedure carried out by Dr. Seybold in his office. Undoubtedly, in his experience, following this very definite procedure, his results have been most satisfactory under general anesthesia. But, in his discussion, he states that it is often necessary for him to employ a local anesthesia. This again bears out my contention that the subject cannot be debated, as we have both acknowledged the fact that general as well as local anesthesia must be employed in the practice of exodontia and oral surgery. I sincerely hope statements made here have brought out points in favor of both general and local anesthesia, and will in no way create in the minds of the audience the impression, that any one form can be used to the exclusion of the other.

DIAGNOSIS AND SURGICAL TREATMENT OF TRIGEMINAL NEURALGIA*

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ALTHOUGH trigeminal neuralgia is a clinical entity which can be relieved temporarily by palliative measures, and permanently by division of the sensory root, there is still much confusion concerning diagnosis and appropriate treatment.

HISTORICAL SKETCH

Krause[1] credited Avicenna with describing the disease, originally, as "tortura facies" about 1000 A. D. Fothergill, in 1773, described the disease as a "painful affection of the face." Many others contributed subsequently to the treatment, but little has been added to the original description of the symptoms.

The exact anatomic involvement was not learned until after the experiments of Magendie, about 1821, and of Bell, whose book was published in 1844. Previous to their time, Meckel had expressed the belief that the facial nerve supplied not only motor but also sensory divisions to the face, and Eckhard had considered the fifth nerve to be the nerve of taste. Schlichtung was the first to cut the infra-orbital nerve for "facial neuralgia," in 1748. Prior to the experimental work of Bell and Magendie, when a nerve was cut for neuralgia, the operation usually involved the facial nerve. Langier, in 1778, reported such a surgical procedure, without resulting relief. After 1821, peripheral neurectomy was resorted to. Lizars[2] was probably the first to cut the inferior dental nerve, in 1821. Wagner,[3] in 1869, reported 135 peripheral neurectomies.

Mears[4] was probably the first to sug-

*Read before Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 23, 1930.

1. Krause, F.: Neuralgie des Trigeminus, Leipzig: F. C. W. Vogel, 1896, p. 103.

2. Lizars, quoted by Dandy, W. E.; Operation for Cure of Tic Douloureux; Partial Section of Sensory Root at Pons, Arch. Surg., 18:687-734 (Feb.) 1929.

3. Wagner: Quoted by Dandy (Footnote 2).

4. Mears, J. E.: Pathologic Changes Occuring in Trifacial Neuralgia, with Report of Case in Which Three Inches of Inferior Dental Nerve Were Excised, Tr. Am. Surg. Assn., 2:469-490, 1885.

gest the radical treatment of ganglionectomy for trigeminal neuralgia. He advised an intracranial approach through the foramen ovale, enlarging it sufficiently to permit partial avulsion of the ganglion. Rose,[5] in 1892, advanced the radical procedure in which wider exposure of the ganglion was afforded through the floor of the middle fossa. All of these procedures were attended by considerable bleeding and a high mortality rate. Hartley,[6] in 1892, a little before Krause, described a precisely similar surgical procedure, with an intracranial approach to the division of the second and third branches peripherally to the ganglion. Since this operation was not superior to peripheral neurectomy, the technic was not universally accepted. Krause, in 1893, followed out his original idea of exposing the ganglion, with the branches, extradurally, but included avulsion of the ganglion, with division of the peripheral branches. Horsley,[7] in 1891, antedating Hartley, and Krause attempted to relieve trigeminal neuralgia by avulsion of the sensory root, but because of the death of the patient, little cognizance was taken of the operation. Horsley stated that Macewen had tried a similar procedure with a similar result, basing his procedure on the idea that it was unwise to perform avulsion of the ganglion because of its intimate association with the cavernous sinus. It was obvious that these pioneer surgeons were groping about for a radical procedure which would give permanent relief without the attending surgical hazard. It was not until 1898 that Spiller,[8] in collaboration with Keen, expressed the belief that division of the sensory root of the trigeminal nerve should offer a solution, provided it could be shown that regeneration would not take place afterward.

It was proved by Frazier and Spiller,[9] in 1900 and 1904, and by Van Gehuchten,[10] in 1903, that interruption of the sensory root would result in permanent anesthesia in the peripheral distribution of the nerve, and that it would be impossible for the severed fibers to reestablish their pontine connections. The surgical application was carried out with success by Frazier in 1900, and subsequently to this epoch-making operation, the radical treatment was changed gradually from ganglionectomy of the Krause-Cushing type to division of the sensory root, which is the accepted radical treatment that persists at present. Likewise, palliative peripheral neurectomy has been replaced gradually by alcoholic injection of the peripheral branches. Pitres and Verger,[11] in 1902, and Schlösser,[12] in 1903, were among the first to advocate

5. Rose, William: Surgical Treatment of Trigeminal Neuralgia, Lancet, 1:295-302 (Feb.) 1892.

6. Hartley, F.: Intracranial Neurectomy of Second and Third Divisions of Fifth Nerve; New Method, New York M. J., 55:317-319, 1892.

7. Horsley, V.: Various Surgical Procedures Devised for Relief or Cure of Trigeminal Neuralgia (Tic Douloureux), Brit. M. J., 2:1139-1143 (Nov. 28); 1191-1193 (Dec. 5); 1249-1252 (Dec. 12) 1891.

8. Keen, W. W., and Spiller, W. G.: Resection of Gasserian Ganglion, Am. J. M. Sc., 116:503-532 (Nov.) 1898.

9. Frazier, C. H., and Spiller, W. C.: Physiologic Extirpation of Ganglion of Gasser; Further Report on Division of Sensory Root for Tic Douloureaux, Based on Observations of Four Cases, J. A. M. A., 43:943-947 (Oct. 1) 1904.

10. Van Gehuchten, A.: Le traitement chirurgical de la neuralgie trifaciale, Le Nevraxe, 5:199-226, 1903-1904.

11. Pitres and Verger, quoted by Hutchinson, J.: Operative Treatment of Trigeminal Neuralgia, Lancet, 2:12-14 (July 6) 1918.

12. Schlösser: Heilung peripherer Reizzustände sensibler und motorischer Nerven, Ztschr. f. Augenheilk., 10:335, 1903.

this treatment. Härtel,[13] in 1914, described a technic for injecting the gasserian ganglion with alcohol. Harris,[14] at the present time, is a strong advocate of alcoholic injection of the ganglion, but, because of the possibility of injecting alcohol into the subarachnoid space and of the development of keratitis, which frequently follows injection of the ganglion, the procedure is not generally accepted. Deep injection of the peripheral branches is considered reasonable and justifiable as a palliative measure. The technic generally used is that described originally by Lévy and Baudouin[15] in 1906, and modified by Patrick[16] in 1907. The details of the technic for alcoholic injection, and a consideration of the various methods of division of the sensory root, will be outlined later in this paper.

ETIOLOGY

The specific etiology of trigeminal neuralgia is still unknown. Horsley[7] once expressed the belief that it was due to ascending neuritis following dental caries, but since there were no objective sensory or motor findings to confirm this belief, and since extraction of the carious teeth failed to prevent subsequent attacks, this assumption was not accepted. Frazier[9] once stated that it might be due to sclerosis of the gasserian ganglion, and Dana[17] attributed the condition to degenerative changes in the ganglion; but, unfortunately, pathologists are unable to demonstrate specific pathologic changes. Trigeminal neuralgia occurs in the later decades of life concurrently with degenerative changes in other organs and with arteriosclerosis. It is barely possible that infection of the gasserian ganglion is the underlying cause of trigeminal neuralgia, but it is difficult to understand why the attacks are paroxysmal if the condition is due to a pathologic lesion, as previously described.

Since it is not uncommon for trigeminal neuralgia to be associated with migraine, with other forms of neuralgia and with marked vasodilatation and reddening of the skin over the affected region during an attack, it seems that there must be a circulatory phenomenon which gives rise to the paroxysms of pain. This belief is substantiated by the fact that the attacks of pain are relieved by breaking the sensory reflex with deep injections of alcohol, and peripheral and deep avulsion. It has been the general belief that the disease is primary in the ganglion, but in view of the negative pathologic features, and in the light of the effects of operation on the sympathetic nervous system, I am impressed more and more with the fact that trigeminal neuralgia may be of central origin and that palliative and radical treatment does nothing more than to interrupt the sensory reflex.

SYMPTOMS

Trigeminal neuralgia is characterized by darting, stabbing, flashlike pains radiating along one or more branches of the trigeminal nerve. The paroxysms of pain usually are initiated by irritation of the

13. Härtel, Fritz: Ueber die intracranielle Injektionsbehandlung der Trigeminusneuralgie, Med. Klin., 1:582-584 (April 5) 1914.

14. Harris: Personal communication to the author.

15. Lévy, Fernand, and Baudouin, Alphonse: Les injections profondes dans le traitement de la névralgie faciale rebelle, Presse méd., 14:108-109 (Feb. 17) 1906.

16. Patrick, H. T.: Treatment of Trifacial Neuralgia by Means of Deep Injections of Alcohol; Report of Sixteen Cases, J. A. M. A., 49:1567-1573 (Nov. 9) 1907.

17. Dana, C. L.: Natural History of Tic Douloureux, with Remarks on Treatment, J. A. M. A., 34:1100-1103 (May 5) 1900.

area involved, such as that caused by washing the face, cleaning the teeth, chewing, swallowing or talking, or by exposure to currents of air. Frequently, a particular area, commonly known as the trigger zone, is more sensitive than are other areas. Patients who suffer from trigeminal neuralgia are seen to protect the painful areas and to avoid talking, smiling or even eating, in an effort to prevent initiation of a paroxysm. The paroxysm may last from a few seconds to a minute or two, and is usually followed by an interval of complete relief varying from a few minutes to several hours. It may occur in almost any decade of life, rarely in the first decade, and is most common after the fourth decade. The attacks of paroxysmal pain at first last perhaps only a few weeks, with an interval of relief for months, but as the disease progresses, the attacks are of longer duration and greater intensity. With the involvement of more than one branch, the pain remains more or less constant. As a rule, the patient complains at first of a very sensitive area, confined in some cases to one or more teeth. Unfortunately, extraction of the teeth fails to relieve the pain. Again, pain is experienced over an antrum or a sinus. This likewise fails to yield to medical or surgical treatment for the supposed infection of the sinus.

It must be borne in mind that the attacks may pass spontaneously into a quiescent stage, and, not infrequently, various types of treatment are accredited with effecting relief, when in reality the cessation of pain is more or less coincidental. Deep injections of alcohol and division of the sensory root are the only means for actual interruption of the paroxysms of pain.

DIFFERENTIAL DIAGNOSIS

Since the success of treatment depends on the accuracy of the diagnosis, it is well to bear in mind other lesions that produce facial pain. Migraine occasionally produces pain which radiates over the forehead and passes into the eyeball and orbit, but since trigeminal neuralgia is not associated with headache, the history of such periodic headaches, with pain radiating into the ophthalmic branch of the nerve, rules out the possibility of trigeminal neuralgia. Pain incidental to infection of a sinus is more or less constant rather than paroxysmal, and frequently is associated with local tenderness. The pain occurs independently of external irritation and is not aggravated by washing the face, talking, chewing or swallowing as is the case in trigeminal neuralgia.

"Jumping" toothache occasionally simulates trigeminal neuralgia, and, at the onset, may be difficult to distinguish from trigeminal pain. If the pain persists, pathologic evidence will soon be forthcoming from careful general or roentgenologic examination. Then, too, in case of pain from dental caries, the pain usually persists after the patient retires; whereas, in cases of trigeminal neuralgia, the pain, at the onset, is rarely initiated during the patient's sleep. Occasionally, infectious or traumatic neuritis follows the extraction of teeth. This is characterized by a more or less constant gnawing, burning pain, which, unfortunately, is not relieved by the palliative or the radical treatment employed in the treatment of trigeminal neuralgia.

With the introduction of block anesthesia for dental operations, another facial pain has developed; that is, the pain that follows injury to the nerve at the time of injection, resulting in either temporary or permanent anesthesia. The

localized anesthesia, which persists occasionally, is accompanied by numerous paresthetic symptoms: stiffness, hypersensitiveness of the skin and burning pain. These symptoms ultimately subside. Practically no dysfunction follows, and rarely do trophic changes develop either in the teeth or in the gums or mandible.

Glossopharyngeal neuralgia simulates trigeminal neuralgia in being intermittent and paroxysmal. It is brought on by similar conditions, and occurs at about the same time of life, except that it follows the distribution of the glossopharyngeal nerve instead of that of the trigeminal nerve. The trigger zone, in cases of glossopharyngeal neuralgia, is situated in the tonsillar fossa, and the paroxysms are initiated by yawning, swallowing, talking, laughing and coughing, with needle-like pains radiating to the ear drum instead of down the branches of the fifth nerve. If doubt exists with regard to the differential diagnosis, thorough cocainization of the throat is advisable. This anesthetizes the trigger zone and causes cessation of glossopharyngeal pain. If the lesion is of trigeminal origin, the paroxysms of pain will not be influenced.

Sphenopalatine neuralgia, as described by Sluder,[18] is "a lower half headache" and is characterized by more or less constant boring pain, situated apparently in the maxilla. It is sometimes most pronounced under the malar bone, and at other times in the gums of the maxilla and in the hard palate, with radiation toward the sphenoid region and down the neck. Sluder reported relief in many of these cases from injections of alcohol and phenol into the sphenopalatine ganglion, and external application of silver nitrate to the ganglion. Other surgeons have reported less favorable results, which coincide with my experience. Besides the boring, pressing pain, there may be burning, smarting or pricking pain in the same area, and occasional involvement of the eyeball and even of the area supplied by the mandibular branch of the trigeminal nerve, causing unpleasant sensations in the lower lip and the margin of the tongue. This pain differs from that of trigeminal neuralgia in that it is more or less constant, is not paroxysmal and is moderately severe, but no sufficient to incapacitate the patient unless he is of a neurotic temperament. If the patient has a neurotic temperament, the pain is always greatly accentuated and incapacitating. Neither deep injection of alcohol into the branches of the trigeminal nerve nor division of the sensory root affords relief in the treatment of this type of neuralgia. As a matter of fact, the condition is aggravated, since the numbness, instead of affording relief, produces additional irritation.

Mixter,[19] in an unpublished article, reported a favorable experience in the relief of these paresthetic symptoms by cervicothoracic ganglionectomy and trunk resection. Before carrying out the major procedure, he employed the local anesthetic test: paravertebral injection of the first and second thoracic nerves. If the drawing, burning sensations were relieved by paravertebral anesthesia, he concluded that they were due to vascular phenomena of sympathetic origin and proceeded to ablate these fibers by operation on the sympathetic apparatus. At the 1930 meeting of the American Neurological Association, he reported success in several cases in which he had performed cervicothoracic ganglionectomy and trunk resection for the relief of these

18. Sluder, Greenfield: Two Cases of Tic Douloureux of Sphenoidal Inflammatory Etiology, Laryngoscope, 26:122-123, 1916.

19. Mixter, J.: Personal communication to the author.

paresthetic symptoms, following division of the sensory root for trigeminal neuralgia.

PALLIATIVE TREATMENT

At the onset of the disease, it is difficult for patients to realize fully that they have acquired a disease which is going to continue in paroxysmal attacks and gradually become sufficiently severe to demand radical operation in order to obtain permanent relief. Therefore, they willingly try various therapeutic measures consisting of local operations on the involved region and suggestive treatment of the various cults. It is important, in the treatment of these patients, to offer a rational course of palliative treatment which actually will afford temporary relief until such time as they have become thoroughly satisfied that they must accept the radical operation.

There is no form of specific medication of any material value. Inhalation of trichlorethylene (trethylene), 30 drops on a sponge, administered every two or three hours, may minimize the paroxysms of pain. Opiates, likewise, may give hours of relief but should not be administered as a routine on account of the chronicity of the disease. The best of the various palliative measures consists in alcoholic injection of the main branches of these nerves as they leave the skull, and injection of alcohol into the trigger zone. Injection of the peripheral branches at the mental, infra-orbital, and supra-orbital foramina may offer slight relief. Deep injection offers the greatest relief. The average period of freedom from pain is about nine months. Occasionally, it is impossible to effect successful injection of the deep branches. In approximately 70 per cent of cases, it is successful. Frequently, relief is obtained from deep injection for a period of from two to three years. This procedure can be repeated. With each successive injection, the relief is of shorter duration and is of a lesser degree, since infiltration is imperfect, because of the scar tissue that results from each injection.

Injections are not always free from complications. Occasionally, branches of the internal maxillary artery are injured, extensive hematoma resulting, and ocular palsy has been known to occur; but, on the whole, deep injection is, in experienced hands, justifiable. Successful deep injection serves a threefold purpose: it offers temporary relief, particularly for elderly patients who are not good operative risks; it produces anesthesia and confirms or alters the diagnosis, since successful injection always gives relief from trigeminal neuralgia, and it educates the patient to the postoperative numbness which he must accept in lieu of the excruciating pain.

Although deep injection of alcohol is justifiable, it is unwise to repeat it indefinitely after complete relief is no longer afforded, especially since the disease never will cease spontaneously, and radical operation will be necessary sooner or later. Injection of alcohol is most successful when only one branch is involved in the disease. Often, injection may be successful in one branch and only partially successful in another branch; which is a means of annoyance to the patient despite the partial relief obtained. Injection of alcohol into the ophthalmic branch is not always successful, since one is hesitant about administering a large amount of alcohol deep in the orbit. If there is no contra-indication, division of the sensory root is advocated after two or three deep injections of alcohol, or if more than one branch is involved, or the ophthalmic branch is involved and the paroxysms of

pain are not relieved by superficial injection.

Technic of Injection.—Patrick described injection of alcohol as follows:

The needle employed is about 8 cm. in length and 1.5 mm. in diameter, and is of the trocar and cannula type, the cannula being graduated in centimeters in order to indicate the depth reached. Before inserting the needle the skin is cocainized; as soon as the proper depth has been reached, the trocar is replaced by a glass syringe, fitted into the cannula, and about 2 c.c. of 80 per cent solution of alcohol is injected.

The patient usually experiences pain when the nerve is approached, but this is quickly followed by numbness. Since the injection under local anesthesia is more or less painful, in the section of the clinic in which this work is done, the technic employed is that suggested by Frazier: the patient is partially anesthetized with nitrous oxid, until he passes into the analgesic state. This prevents his experiencing pain when the needle is inserted. If, on the needle entering the nerve, the patient complains of considerable discomfort, deeper anesthesia is induced prior to the administration of the alcohol, which minimizes the pain and the shock incident to the injection.

The mandibular branch is injected at its exit from the foramen ovale and is reached by placing the needle through the skin at a point 2.5 cm. in front of the descending root of the zygoma, which almost coincides with the anterior bony border of the external auditory meatus. The needle is directed slightly upward along the base of the skull and a little backward at a depth of 4 cm. The superior maxillary division is injected by placing the needle through the skin, 0.5 cm. posterior to the external angle of the orbit underneath the zygoma, directing it vertically to the anteroposterior line, but inclining it slightly upward, in a direction which should reach the nerve at a depth of 5 cm., at its emergence from the foramen rotundum.

MAJOR OPERATIONS

As has been stated, the more or less universal operation consists in some form of division of the sensory root. The original operation proposed by Spiller consisted in complete division, including the motor fibers. This was first modified by preserving the motor fibers, which in turn preserved the function of the temporal, masseter and two pterygoid muscles, and prevented the atrophy that usually followed when the motor fibers were divided. This operation has the advantage of affecting complete interruption of all sensory fibers of the fifth nerve and prevents the possibility of recurrence of the neuralgia. It has the disadvantage of producing corneal anesthesia, which subjects the eye to greater possibilities of trauma.

The second modification of the original operation was carried out by Frazier and his supporters. It consists in partial section of the sensory root, with preservation of the innermost fibers as a means of preserving the ophthalmic portion of the trigeminal nerve, in order to assure sensation of the cornea. Although this procedure has the advantage of preserving sensation to the cornea, it has the disadvantage of allowing possible recurrence in the ophthalmic portion, as well as the disadvantage of being an incomplete operation for the relief of the major neuralgia. It is impossible clearly to identify the fibers in the posterior root that pass through the ganglion to the peripheral branches.

The third modification consists in either complete or partial section of the sensory root by the intradural cerebellar

approach, as carried out by Dandy[20] since 1925, and as employed also by Dollinger[21] in 1912. Dandy made rather sweeping claims for this approach as well as rather sweeping condemnation of the transtemporal extradural approach. The real advantage of this surgical procedure, provided subsequent experience bears out the original observation, is that it allows the subjective pain to be relieved by partial section of the sensory root, without materially altering the objective sensations in the distribution of the fifth nerve. The disadvantage of the cerebellar approach is that the procedure is of greater magnitude and is attended by more complications and undesirable sequelae than is the modern transtemporal extradural approach.

In view of the fact that the radical operation has been performed at the clinic in 578 cases, and that, also, a large number of cerebellar operations of various sorts have been performed, I am still an adherent of division of the sensory root by the extradural transtemporal approach for trigeminal neuralgia. It can be done with greater ease, with fewer complications and with more nearly universal success than can any other operations that have been suggested. The technic as it is employed at the Mayo Clinic has been improved to avoid surgical and postoperative hemorrhage, to prevent cerebral injury and ocular palsy, to preserve the motor fibers and to minimize the incidence of keratitis and of facial paralysis. Complete section of the sensory root is effected with ease, rapidity, lack of surgical shock and low mortality (less than 1 per cent).

Operative Technic.—Preoperative examinations that usually are employed in arriving at a diagnosis and at an estimate of operability in cases of other major surgical lesions are employed in the preparation for radical operation of patients with trigeminal neuralgia. As many of the patients are senile, and present complicating constitutional diseases, in addition to being dehydrated and emaciated, preoperative rehabilitating treatment may be necessary. Often, I accept for operation patients who present a greater surgical risk than is deemed desirable by the general surgeon in the treatment of general surgical conditions requiring major operation. This is due to the fact that the operation can be carried out with little attending surgical shock and, if the patient is relieved of the excruciating trigeminal pain and thus is permitted again to take nourishment in normal amounts, he will recover more readily from his constitutional disease.

Certain surgeons prefer to employ local anesthesia. Coughlin,[22] Dowman[23] and Peet[24] are among these. Dandy prefers rectal administration of tribromethyl alcohol in order to minimize the intracranial pressure. At one time, I carried out the radical operation under a combination of local anesthesia and administration of ether at the time of sectioning the sensory root, but recently I have again resorted to performing the entire operation under

20. Dandy, W. E.: Section of Sensory Root of Trigeminal Nerve at Pons; Preliminary Report of Operative Procedure, Bull. Johns Hopkins Hosp., 36:105-106 (Feb.) 1925.

21. Dollinger, Julius: Die Behandlung der Trigeminusneuralgien mit den Schloesserchen Alkololein skritzungen, Deutsch. Med. Wchnschr. 38:297-302 (Feb. 15) 1912.

22. Coughlin, W. T.: Section of Sensory Root of Fifth Cranial Nerve Under Local Anaesthesia, Surg., Gynec. & Obst., 33:424-428 (Oct.) 1921.

23. Dowman, C. E.: Personal communication to author.

24. Peet, M. M.: Personal communication to the author.

ether anesthesia. I see no serious objection to the administration of ether. Pneumonia is an extremely rare complication, and a general anesthetic interrupts the paroxysms of pain immediately, facilitating the operative procedure.

The operative field is prepared; the patient is placed on the operating table, on his back, with his head in what is called a ganglion headrest, and the table is adjusted until the zygoma is in a plane parallel with the floor. The headrest is adjustable, so that the head can be tilted toward the surgeon, which permits easy exposure of the middle fossa, and, at the same time, allows the blood and cerebrospinal fluid to flow away from the gasserian ganglion or sensory root. The incision is made in front of the ear, extending upward and backward from the zygoma. The lower point of the incision is situated 1 cm. in front of the tragus on the upper margin of the zygoma, and the upper point 4 cm. above the helix of the ear. The temporal fascia is also incised for a distance of 5 mm. in each direction, at right angles to the incision along the upper margin of the zygoma, before the muscle is incised. The skull is then trephined, and the opening is enlarged to a diameter of about 3 cm. It is well to enlarge the opening in a downward and mesial direction so that the approach will be directly mesially along the floor of the middle fossa.

When the dura is being elevated, care should be taken to avoid injuring or tearing it, since this adds to the difficulty of controlling bleeding of the middle meningeal artery. It is well to free the dura from the bone at the outset, with a dural elevator which is curved on the posterior surface and has sharp edges. This instrument helps to loosen the dura if it is densely adherent to the bone. I have rarely encountered this difficulty in cases in which the patients were less than 60 years old, but in cases in which the patients are in the late sixties or seventies, the dura usually is very adherent and often much thinner than in younger persons. If, by chance, the middle meningeal artery has been torn at this stage or in a subsequent stage of the elevation, bleeding can be controlled by placing the ganglion retractor (which is a curved spatula with a small electric light attached) on the vessel below the point of hemorrhage. In proceeding with the elevation of the dura, the surgeon should bear in mind that the floor of the middle fossa almost invariably varies in different persons, and he should not be misled by the various irregularities or grooves that may be present. Having once assured himself that the dissection was started in the middle fossa, he will find the middle meningeal artery and the third branch of the trigeminal nerve passing through the foramen spinosum and the foramen ovale at the innermost and most dependent portion of the middle fossa. Should the surgeon discover, in the course of the dissection, that he is approaching an elevation anteriorly, he should at once direct the dissection downward toward the hollow of the fossa. Should he approach an elevation posteriorly, he is again going astray, and should direct the dissection back to the most dependent portion of the middle fossa and proceed mesially, following the general direction of the middle meningeal artery, which is being elevated with the dura. Occasionally, the middle meningeal artery may take an anterior or posterior direction from the foramen spinosum, and may not be observed in the line of dissection. The surgeon will find that, if he is careful to adjust the head so that the zygomatic plane is parallel with the floor, he will be oriented at all times and will not waste time at-

tempting to study anatomic relations in the middle fossa before exposure of the third branch. The dura should be elevated gently with a ganglion retractor and separated from the bone by cotton pledgets held in bayonet forceps. The pledgets used for this purpose, as suggested by Frazier, are made of a dental roll, cut in various sizes. These rolls come in lengths of 15 cm. and, after being sterilized, are cut into pledgets varying from 5 to 15 mm. in length. They are particularly useful since they have sufficient body to aid dissection and absorb blood. If it is necessary to control venous oozing, a dental pack, with a linen suture attached, serves the purpose, and permits continuation of the operation.

After the middle meningeal artery has been exposed, it is convenient to ligate it just as it leaves the foramen spinosum. It is dissected free from the dura at the foramen, an end suture is then passed around the artery with a modified aneurysm needle, and the suture is tied with the aid of a small knot tier, similar to the Böttcher knot tier used in tonsillectomy. The knot is placed in the suture outside the cranial wound, but is pushed down and secured around the artery with the knot tier. Three knots are made: the first two are loose, granny knots; the second knot tightens the first, and the third is reversed in order to secure the first two as a square knot to prevent slipping. The artery is then divided with long, narrow scissors distally to the ligature. In case the artery is injured at the foramen spinosum by a sharp spur, hemorrhage might be controlled by a wooden plug, but preferably is controlled with Horsley's bone wax. If stiff wax is used, difficulty will be encountered in molding it into the foramen spinosum. Soft wax will be forced out by the pulsations of the middle meningeal artery. If the hard wax is warmed to a temperature of 110 F., and then applied, it can be easily molded into the foramen and then held in place for a few seconds until it cools. This procedure can be carried out most effectively by the aid of a dental pledget, dipped in sodium chlorid solution of the same temperature, which prevents the cotton from sticking to the wax. When hemorrhage from the middle meningeal artery has been controlled, the third branch of the trigeminal nerve is exposed just mesially and slightly anterior to the foramen spinosum. It is not necessary to continue the dissection anteriorly to expose the second or first branches, but it should be carried along the outer margin of the third branch and ganglion. The dura should be elevated gently from the lateral portion of the ganglion by a rotating movement of the dental pledgets rather than by direct pressure toward the ganglion, as this frequently will produce rents in the arachnoid. During elevation of the dura from the third branch and the lateral portion of the ganglion, reflection of dura to the bone is encountered laterally to Meckel's fossa. It has been my experience that the procedure will be greatly facilitated if this is divided with a sharp knife on the anterior surface of the petrous bone, in a plane parallel to the zygoma. It has been observed also that the dissection can readily be continued without injury to the arachnoid and without danger of elevating the ganglion and its sheath from Meckel's fossa, which, according to Kanavel and Davis, may produce trauma to the superficial petrosal nerve, and, in turn, give rise to disturbance in the geniculate ganglion, and occasional temporary facial paralysis.

After the third branch and the lateral half of the ganglion have been exposed, the dissection is carried posteriorly and upward until pulsations are seen beneath

the arachnoid. These are set up in the cerebrospinal fluid around the sensory root, posterior to the ganglion, since the arachnoid is not attached to the sensory root or motor fibers but to the margin of the semilunar ganglion. The dissection should be carried posteriorly to the ridge of the petrous bone, exposing an area of pulsating arachnoid about 1 cm. in diameter. During the dissection, the dura is held taut and retracted laterally and upward with a ganglion retractor to avoid injury to the third, fourth and sixth cranial nerves. The pulsating arachnoid is then incised with a small right-angled ganglion knife, and a semilunar incision is made from the mesial to the lateral aspect, with a bow over the ridge of the petrous bone, permitting the arachnoid flap to fall toward the middle fossa, liberating the cerebrospinal fluid and exposing the sensory root. The motor root lies ventrally to the sensory root, and usually along the mesial side, but it may take a median ventral position until it reaches the margin of the ganglion, when it takes an abrupt turn downward and laterally underneath the gasserion ganglion, into a separate sheath, to become continuous with the third branch.

In order to preserve the motor root, I follow the technic which I have described. Since the sensory root lies nearer the surface than the motor root and spreads out like a fan to the gasserian ganglion, it can be brought into view readily by retracting it in a downward and lateral direction with a small right-angled blunt hook, at its juncture with the ganglion. This retraction places the sensory root under tension and relaxes the motor root, which is not elevated with retraction of the sensory root. Furthermore, the line of traction is in the direction of the normal course of the motor root.

In about half of the cases in which this procedure is followed, the motor root can be seen to form a small bend or elbow on the mesial side of the sensory root. In the other cases, it may be slightly adherent to the inferior surface of the sensory root. When the sensory root is rotated laterally, the motor root is found to lie in a relaxed position ventrally to the sensory fiber, the latter being under tension and the motor fibers in the relaxed position. The motor root is then isolated and held mesially by the blunt hook, while the sensory fibers are either avulsed or cut proximally to the ganglion. Care should be taken to avoid trauma to the motor root, as it will give rise to temporary paralysis of the masseter, temporal and pterygoid muscles. Care should be taken, also, to avoid trauma to the ophthalmic portion of the ganglion in order to prevent conjunctivitis and trophic keratitis. Previous to closure of the wound, venous oozing should be controlled by small muscle pledgets, wax, if the oozing is from the bone, or a small iodoform gauze pack, which should be removed in from twenty-four to forty-eight hours. The wound is closed in the usual manner, preferably with interrupted silk sutures. The advantage of the straight incision is that it provides ample exposure, permits splitting to the temporal muscle, is quickly made and closed and does not injure the nerve to the frontalis portion of the occipitofrontalis muscle.

The postoperative care is similar to that demanded after any major procedure, except that special care of the eye is necessary. During the operation, the lids are held securely closed by a strip of adhesive tape, which is replaced by a Buller's shield when the patient regains consciousness. The shield is worn for three or four days, and is then replaced by a pair of glasses fitted with a corneal

shield. A special celluloid cup is attached to the rim of the frame to prevent the entrance of foreign bodies during exposure to dust and wind. It is usually unnecessary for the patient to wear the glasses when in the home or office, but protection of the eye against the entrance of foreign bodies cannot be urged too strongly, since the cornea, as well as the skin supplied by the branches of the fifth nerve, is anesthetic. I recommend daily irrigation of the eye with 2 per cent solution of boric acid, especially after exposure to dust or wind, to insure thorough cleansing and removal of any small foreign bodies which might have lodged in the eye. I have observed that herpes occasionally will appear over the distribution of the affected branches after operation. This is no particular significance unless it affects the ophthalmic branch, when the eye should be covered with a Buller's shield until the herpetic patches disappear, which is in about ten days, as a rule. If the herpes occurs in or around the nose or on the lip, a mild medicated ointment is all that is necessary. If it occurs within the mouth, an antiseptic mouth wash is efficacious. Occasionally a patient may bite the anesthetized cheek. The teeth should be examined to make sure that there is no unnecessary irritation from bridgework, an irregularly placed tooth or a portion of a decayed tooth. After operation, the patient should, as a rule, remain in the hospital for about a week, and should be kept under observation, for surgical dressings, for from three to seven days longer.

SUMMARY

Since the symptoms of trigeminal neuralgia, at the onset, are rather mild, palliative measures are justified early in the disease. Preferably, these should consist of from one to three deep injections of alcohol. However, I am opposed to continuance of the injections over a long period of time, especially when they fail to afford complete relief or when one or more branches of the nerve become involved in the disease.

I am not convinced that the cerebellar approach should replace the transtemporal, extradural approach to the sensory root. Partial section of the sensory root by the Frazier technic, with the transtemporal approach, preserves the ophthalmic portion of the trigeminal nerve with greater ease and fewer complications.

Experience at the clinic has shown a higher degree of involvement of the ophthalmic branch than Frazier has experienced. It is my opinion, therefore, that partial section of the sensory root should be employed only for patients who thoroughly understand the situation and who are willing to undergo a second intracranial operation should the disease recur.

With the precaution observed in the technic which my associates and I employ at present, postoperative conjunctivitis and keratitis occur only rarely. This is due mainly, I believe, to the fact that the ophthalmic, or mesial, portion of the ganglion is not exposed or traumatized during the operation.

Facial paralysis, a serious complication with earlier ganglionectomy and root resection by the transtemporal approach, has been greatly reduced in frequency (from 1 to 2 per cent). It has occurred only rarely since elevation of the ganglion has been avoided as a precautionary measure during reflection of the dura from the body of the ganglion.

In bilateral trigeminal neuralgia, there is no contraindication to employing the transtemporal approach, on both sides, as long as the motor fibers are completely preserved, as they are in the present tech-

nic. The incidence of bilateral involvement is about 2 per cent, and although the disease may begin simultaneously on both sides, it is more likely to begin at an earlier period in life on one side than on the other. There is no need to section the sensory root on both sides at the same time, since there is a distinct advantage in preserving sensation on one side as long as possible.

DISCUSSION

W. F. Drea, Colorado Springs, Colo.: I would like to ask Dr. Adson if he has had any experience with irradiation and what he thinks of the probable palliative influence following use of the roentgen rays. I know that several of the French physicians have reported favorably on the use of this agent in sciatica as well as in trigeminal neuralgia, and it seems that it may have some influence.

George F. Seeman, Nashville, Tenn.: I have been associated with a neurologic surgeon, Thomas D. McKinney, and so have seen quite a few of the operations described by Dr. Adson. Dr. McKinney advocates section of the lower two-thirds of the sensory root, leaving the fibers which form the ophthalmic branch, in all cases, where this division is not involved. Then, if the patient later has pain in the ophthalmic branch, it is easy enough to section the remaining one third of the sensory root. This partial section avoids the corneal anesthesia which necessitates special care of the eye, such as wearing, a protecting shield to avoid corneal injury, which would result in ulceration, keratitis and possible loss of vision. I would like also to ask Dr. Adson if he has had any experience with trethylene inhalation for palliative treatment.

W. L. Shearer, Omaha, Nebr.: It has been my good fortune to watch the work that has been presented in neurologic surgery by Cushing, Frazier, Patrick and others, and then to come on that wonderfully refined technic Dr. Adson has given us. It was Dr. Adson who gave us the delicate technic that has made it possible to reduce so greatly the mortality of these sufferers. The question of etiology has been a baffling one to all. I can remember the time when Dr. Adson made the statement that infections from the teeth and jaws, infections associated with sinuses, etc., did not have anything to do with trigeminal neuralgia. Later, in Los Angeles, he made the statement that he now felt that perhaps the infection would be traced from the terminal branches, from infections around the sinuses and the teeth, and might be a causative condition, and some day he might prove it. I have always felt that he would be the man who would ultimately give us the true etiology of trigeminal neuralgia.

Dr. Adson: With reference to the value of roentgen-ray treatment in trigeminal neuralgia: I am quite familiar with the experimental work which has been carried out in France, but I regret to say that in my experience little has been accomplished by roentgen-ray therapy in trigeminal neuralgia. Unfortunately, the specific etiology of trigeminal neuralgia is not known. Sir Victor Horsley believed it to be due to ascending neuritis resulting from dental caries, but this could not be substantiated. Dana expressed the opinion that it is due to degenerative changes in the ganglion. Frazier believes it to be due to sclerotic changes. We all believe that the disease is in the ganglion. It is barely possible that it may be the result of vasomotor disturbance, and that the relief from pain following deep alcoholic injection and section of the nerve root is purely symptomatic, in some way breaking the vasomotor reflex. Although a consideration of surgery of the sympathetic nervous system is scarcely in keeping with my paper, I wish to say that, in my experience, sympathetic ganglionectomy and trunk resection afford definite relief in cases of Raynaud's disease, thromboangiitis obliterans with vasomotor spasm and a selected group of cases of acral scleroderma and atrophic arthritis. Subtotal section of the posterior root, suggested by Frazier, is a justifiable procedure. A large percentage of patients suffering from trigeminal neuralgia also have involvement of the opthalmic branch, in view of which I favor complete section of the sensory root. I advocate subtotal section in selected cases only when the disease is confined to the second and third branches. Trethylene affords symptomatic relief in some instances, but it rarely relieves pain. It is administered by the inhalation method, approximately 30 drops being required to produce any effect. The trethylene is placed on a sponge and the vapor inhaled. The relief is due apparently to anesthesia of

the mucous membrane, which persists for about thirty minutes. The inhalation can be repeated many times a day, and may serve as a palliative measure during severe paroxysms of pain. The only satisfactory palliative measure is deep injection of the nerve with alcohol, and the only measure for permanent relief is section of the sensory root.

WHAT IS "THE ONE THING NEEDFUL"?

By JAMES A. BRADY, D.D.S., Philadelphia, Pa.

THE July (1931) issue of THE JOURNAL carries an editorial under the provocative title "The One Thing Needful." It is my desire to voice objection here to the apparent purport of that editorial. And, realizing and appreciating the fact that the Editor of our JOURNAL has contributed mightily to the good and welfare of dentistry, I write with great reluctance. However, as a dentist, a member of the American Dental Association, an officer in the Pennsylvania State Dental Society, as a member of the Board of Trustees of the American Dental Association and especially as chairman of a committee to establish an economic bureau in the American Dental Association, I feel it my duty to make public my reactions to the editorial in question.

It might be assumed, although it is not my opinion, that the editorial was written as a bit of subtle propaganda against nascent economic activities of the American Dental Association or was meant as a laudable effort to attract the attention of recently graduated dentists to "professional ideals." But, no matter what motive we attribute to the editorial, it is apparently evident from the information contained therein that the Editor either has the wrong conception of what constitutes dental economics or he is unduly prejudiced against the subject and unwilling to give it its just due. Moreover, it is to be feared that the editorial may further help to implant and sustain the already existing erroneous conception of dental economics which even now bars the way to the proper solution of our economic problem.

The editorial unfortunately confuses what is being taught by certain influences outside of the profession as dental economics with the real article. It is a fact that to the average dentist the term dental economics conveys high pressure salesmanship, charging "all the traffic will bear," the keeping an elaborate and costly system of fee books—not necessarily scientific dental records—and conducting the dental office on a cut-and-dried, unsympathetic matter-of-fact business basis. Such, also, is the interpretation of dental economics conveyed by the editorial. It is an unjustifiable interpretation. Still, I believe it is not the intention of the Editor of the mouthpiece of American dentistry to interpret the activities within the ranks of dentistry in a biased manner.

Economics, properly applied to the practice of dentistry, carries greater potential possibilities for the realization of our highest professional aims than any other single factor. By its application I can see our philosophers guiding us onward; our research men uncovering new facts, our economists making possible the

application of these facts to the public welfare. All agencies harmoniously striving to fulfil our professional mission—to raise the standard of human health and increase human welfare to a point never before attained. Are those aims the antithesis of public morals? Are they contrary to the "professional spirit"? Is our endeavor to synchronize our professional activities with the accepted standards of society such a dastardly thing?

We read in the editorial,

> . . . . there is one thing in addition which should be cultivated more assiduously than it is in the consciousness of every young man or woman beginning the practice of dentistry. This is the thing that we in a vague way term professional spirit. To define professional spirit is not altogether easy. It is embodied more in the essence of self-sacrifice and altruistic service than in the accumulation of money; more in the glory of contributing to the welfare of humanity than in the material gains to be had from our daily endeavors; more in the sweet solace of relieving suffering than in the rewards that men call tangible; more in doing for others than in receiving the fruits for ourselves.
>
> And the pathetic thing is that so few of our recent graduates ever have the faintest conception of what professional spirit is. How could they? Most young men and women enter dental school with the sole idea that it is an honorable calling and one in which they may hope to earn a livelihood and achieve a fair degree of material success. Their aim is laudable enough, but, at this stage of their development, they have very little of the ideal of altruism in their soul. This comes, if it comes at all, only from the actual experience of meeting and mastering human suffering.

Pretty phrases those, sweet sounding epigrams, beautiful phraseology, but, alas, merely words that are now passé. The above represents the philosophy of dentists of independent means, of those possessing lucrative practices, and of the full time dental teacher out of contact with the practical application of dentistry. Those are the men who in the past set up pseudo-ethical standards for the rank and file of dentistry who are faced with the necessity of making a living for themselves and their respective families. Not only has the philosophy never been followed by the profession at large, but the self-ordained dispensers of that philosophy never followed it in fact themselves.

The existing high plane of modern dentistry, plus the higher educational requirements of the present, tends to attract toward dentistry men and women of higher ethical aims and appreciation than ever before. To say that "Most young men and women enter dental school with the sole idea that it is an honorable calling and one in which they may hope to earn a livelihood and achieve a fair degree of material success" and to omit the fact that they also hope for professional success is to libel a body of young men and women who are as keen about their scientific success as any in the history of the world.

If there is a more abused term in the dental nomenclature than the so-called "dental ethics," I should like to know what that is. Too much unfair advantage has been and is being taken of the term. It is used to camouflage arguments that will not stand the light of rational analysis. The average dentist has been taught to believe that ethics is the name of something "not altogether easy" to define, that enters into professional activity and, whatever it is, it must be respected. The above does not sound intelligible, however it is true, and it works in practice after the following manner. The debate is waxing warm when suddenly the wise man with the psychologic turn injects into the discussion, ethics. Eyebrows are raised, heads shake, and instantly looks of suspicion are directed at the hapless debater, who now has not only the responsibility of proving his arguments but he must also placate bogeyman "Ethics."

This is not a tirade against ethics. Emphatically not. It is a voice lifted against the usurpers of the term for false pretense; for professional bigotry. The time has arrived when the intelligence of dentists cannot be fuddled by the use of the term ethics. The dentist is not so prone to emotionalism. Advanced educational requirements are showing results, in as much as he wants to know the whys and wherefores of things. Dentistry has become more and more scientific; it categorically demands a stricter definition of terms.

Persons familiar with the principles of ethics and economics know that they are not in conflict. The inference in the editorial is that ethics and economics are incompatible, or that economics up to a certain point of application is ethical. Such, however, is not the case. Fairchild says that "Economics is the science of human wants and of the institutions and activities through which these wants are secured." Here is a definition which can be applied. It finds ready response in our intelligence and is not dependent upon a hazy supposition of meaning which may be twisted to suit one's convenience.

Economic activities are subject to the ordinary rules of morality. Moral rules and standards embody our conception of welfare, and wealth (economic interpretation) is only a means of welfare. Economic activities are accounted good or bad according as they promote not merely wealth but also welfare. That is moral philosophy. That is true ethics; it is also true economics. Within that moral philosophy may be found fundamental moral guidance for the dental profession. Ethics is a system of moral philosophy, it is nothing more nor less than moral guidance, it is honesty of purpose; truthfulness; desire to treat and be treated fairly by your brother. From the viewpoint of the practicing dentist in his daily routine ethics finds practical application in three principles or responsibilities:

1. Examination and diagnosis of the oral cavity from the standpoint of professional judgment alone. Regardless of pecuniary gain.

2. Service rendered to conform to accepted principles recognized as sound by the profession.

3. That remuneration for services rendered shall be sufficient to keep the dentist and his family in the social position which society expects them to occupy.

Let us look facts in the face. The philosophy which teaches that services can be rendered to patients regardless of cost is not only ridiculous but downright ungodly and if followed results in pauperization and humiliation of the dentist and his family. Self-preservation is the first law of nature and the code that teaches differently cannot endure.

Dentistry, be it remembered, is not a *business* under any circumstances. It is always a *profession,* a humanitarian profession. The measure of success is human welfare, monetary consideration is a by-product. Under our present social system it is obligatory for us to accept certain observances which dictate the necessity for our ability to meet our pecuniary obligations. The unfortunate dentist who fails in this is condemned by the very society he so valiantly attempted to serve.

It is axiomatic that dental service cannot be done free. Somebody must pay for it. The patient, the dentist, or the creditors of the dentist. The dentist can do only the amount of free service that he has money to pay for himself. And if the average net income of the dentist is $2,000 per annum he can pay for very

little. So little in fact, that when compared to the staggering amount of necessary service to be performed for those who cannot afford it, it pales into insignificance. The solution of furnishing dental health service to the average American citizen cannot be found in the pussy-footing efforts of sentimentalists to whom tradition is gospel. What is needed today more than ever before is a social economic outlook. Economics must be applied to the profession, not to make of the profession a business, but to assist it in developing ways and means to distribute wider the scientific service it is capable of rendering.

Young men preparing to enter the profession should be familiar with economic principles, and with the necessity for so guiding their dental activities that they be in harmonious economic relationship with their economic environment. There is nothing unprofessional about such a system nor will it breed hypocrisy.

Tradition is beautiful but progress is more essential. Too much time should not be spent reminiscing on where we came from, it is extremely important to know where we are going. The method of distributing dental service must change. It is antiquated. Just as much out of date as the "sea horse" teeth of the early nineteenth century. Real scientific dentistry is not generally practiced. Children's dentistry is greatly neglected. The dental profession has thus far fallen short of its goal. We still fail to recognize that dental practice involves certain social-economic responsibilities. Lack of understanding of the economics of the problem involved is the cause of this state of affairs. We talk of panel dentistry and other forms of socialized dentistry, we almost weep about it. Do we weep because of the human misery it might cause or because it might affect our already deflated pocketbook? What is the ethics of that situation? Some say state interference with the present method of distributing dental service is mere conjecture. But is it? If the demand for service becomes too great for the dental profession to supply at what the people believe to be a fair cost, and it is fast reaching that point, the state will interfere. Society discriminates between different kinds of wealth, regarding some as more and others as less important to public welfare. The state can and does make that discrimination, it supplies important needs and charges the cost in taxes, education and protection of life, and to an extent public health. It can and already does "socialize consumption" by offering certain kinds of wealth for common use paid for by taxation. Thus we have art galleries, playgrounds, hospitals and so on. Dental service is a form of wealth, which, we have been educating people to believe, is extremely important, it can, will and should be socialized unless the dental profession can make possible the effective distribution of dental service. This can be accomplished by no other means than through an active study and application of economic art and science.

Things of this character constitute true economic study and not what the editorial suggests — office efficiency and high pressure salesmanship. In fulfilling our socio-economic duties as a profession along true economic lines we will not only not kill the goose that lays the golden egg but we shall so nourish it that out of justice and gratitude the egg will assume proportions never dreamed of before.

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TO CURET OR NOT TO CURET*

By MENIFEE R. HOWARD, D.D.S., Denver, Colo.

THE question "to curet or not to curet" has started more or less controversy, not only in the dental world, but also in the medical field.

Stedman terms curettage as the scraping of the interior of a cavity with a curet for the removal of new growths or other abnormal tissue. Perhaps "dissecting away" would not have the undesirable significance in certain minds that curettement does: literally, they mean the same. "Blunt end dissection," which is preferred by some men, is an explanatory term.

As to curets, one may use anything from a light finger touch instrument to a large bone curet. The one of preference is a light pen grasp instrument that affords ease of manipulation, delicacy of touch and sufficient strength. Primarily, the purpose of this paper is to discuss treatment of the dental granuloma. Since infected areas, residual areas and osteomyelitis are closely associated, they will be included.

Much research has been done in an attempt to explain the presence of the so-called dental granuloma. Some are of the opinion that it is evidence of a reaction and, for that reason, it should be left for Nature to remove, after the removal of the tooth or root. Others believe it to be similar in structure to the granulation tissue of bone repair. The same men believe that pus is the result of a natural reaction against bacterial invasion. They drain openly and often extensively, being convinced that drainage is a necessity.

Now, it is obvious that the granuloma will not drain away like pus, so why not curet it at the time of operation? As to its being like the new granulation tissue of bone repair, Weston A. Price maintains that "the function is different—there is quite a difference in the two."

Dr. Cook, of the Mayo Foundation, writes of the granuloma as the result of "productive inflammation or the proliferation of fibroblasts and vascular endothelium of the peridental membrane." He says: "This pressure causes the alveolus to absorb and this resulting space becomes filled with granulation tissue consisting of polymorphonuclear leucocytes, lymphocytes and plasma cells, fibroblasts and capillaries. This mass is surrounded by a fibrous capsule which is continuous with the peridental membrane and is called a dental granuloma." Thoma explains further that "the capsule surrounding the granuloma extends into the medullary spaces between the trabeculae of the bone, progressing, in most instances, until the deeper cancellated tissues become affected." Cook continues: "It is because of this attachment that, in most cases the granuloma is held back in the alveolus after the offending tooth is removed, which makes it advisable not only to extract the offending tooth but also to curet thoroughly the apical region

*Read before the American Society of Oral Surgeons and Exodontists, Washington, D. C., Oct. 4, 1929.

or bone cavity in order to remove any infected granular tissue which might be a source of future infection."

The rarefied bone encountered around apices usually contains bacteria, with their associated products. Often, this condition is the cause of future trouble if not eliminated at the time of operation. Nature, in her protective fight, frequently surrounds the rarefied area with condensed bone; which seems to show the necessity of eliminating this area. Is it not probable that this surrounding condensed bone is Nature's protective wall, thrown up to make it more difficult for infection to enter adjoining tissues?

Osteomyelitis presents an entirely different condition, since Nature obliges by building new bone in the presence of infection. In osteomyelitis, fractures have resulted from the operator's procedure in entering the area to clean out everything, new forming bone as well as diseased tissue. In most of these cases, curetting is contraindicated. Drainage should be maintained and sequestra removed—radical curettement is a procedure often resulting in a far greater loss of bone. With the entrance of the residual area into the field of focal infection, we should realize the exigency of thoroughly finishing our work. Unquestionably, many of these areas are the result of incomplete surgery —at least where the granuloma has not been removed. Undoubtedly, much bone absorption occurs where pathologic conditions remain because of Nature's efforts to remove the infection. Septic granulation tissue about the necks of teeth presents an equally common source of postoperative disturbance.

The contention that certain granulomas contain the required cells to proliferate cystic growths is also worthy in that we quite frequently observe a large cyst which has destroyed a great amount of bony structure in its slow pressure progress. It seems impossible to distinguish one granuloma from another without laboratory examination. In correspondence, one person mentioned that if he thought the granuloma was one possessing cystic qualifications, it was curetted away, but otherwise it was left intact.

The thought that the dental granuloma is an evidence of Nature's reaction to infection and that, if left alone, it will automatically clear up is purely suppositional. Are we not taking a great responsibility on ourselves if we allow it to remain, especially since the vast majority can be easily and completely enucleated at the time of operation?

A few men contend that to remove such a growth stirs up the infection, to be registered in a rise in temperature with an increase in the leukocyte count. This may be true in some instances; but are these men ready to state that the removal of the offending teeth, without curetting, would not cause a greater reaction? In fact, the reaction is much more favorable after the elimination of chronic infection along with other operative procedure. There are many factors in successful operative procedure. Thoughtful diagnosis, followed by careful operative procedure combined with aseptic methods of surgery, plays a big part. It is necessary to have (1) good roentgenograms, properly interpreted; (2) complete equipment; (3) an understanding of the necessity for completely finishing the work started, and (4) a careful operative technic and postoperative treatment. Shearer writes, "Many have discredited the true relationship of mouth infection because of poor results due to poor operation."

Boyd S. Gardner writes, "Often in the case of absent opposing teeth, the bone surrounding the unused teeth becomes

rather rarefied from disuse, and one should be on his guard lest this bone be thoughtlessly removed." This does not refer to the rarefied structure around chronically infected apices and long active granulomas. Shearer has truthfully said, "It is a shame that diseases of the mouth are not accompanied with local pain." Further, "Mere extraction disregards the fundamental principles of bone surgery. We know well that bone surgery demands the removal of dead bone and granulomas." Ivy says, "Many conditions in bone about apices persist after tooth removal if not removed." Shepard, after ten years' observation, remarks, "Grave injustice is done by leaving infected tissue." Fahy writes that there is "no justification in removing the tooth a primary cause and leaving secondary foci from which the reaction is sometimes greater than the primary." Blue's advice is: "Curet the granuloma entirely but do not molest the bone unless bad. In chronic osteitis, remove the soft bone."

I have carefully removed a number of specimens for laboratory examination, few of which failed to produce bacterial growths. These specimens included granulomas, rarefied bone surrounding granulomas and bone from around pulpless teeth and from typical residual areas.

It is not at all difficult to remove a small granuloma through the tooth socket by using a small sharp curet. If the granuloma is large, with infiltrated rarefied bone, the surgical flap method of tooth removal is advocated, enough bone being removed apically to allow access to the involved area. This procedure also affords an opportunity to remove the large one in one mass, to be followed by the removal of any soft, infected surrounding bone. More than that: one is not blindly scraping around in the dark.

WHEN NOT TO CURET

When treating the acute case or an active inflammatory process, it is better first to remove the tooth, thereby establishing drainage. Most of these cases show no bone disturbance except a certain amount of infiltration directly encompassing the apex, making curettement unnecessary. A wise procedure is to reexamine by the roentgen rays after the acute symptoms have abated; then, if necessary, curet at a second operation. The socket of a vital tooth seldom requires cleaning, although it is advisable in some cases to explore it lightly to be sure that there is no granulation tissue present.

WHAT TO CURET

It seems that most men in favor of thoroughly removing granulomas believe that it should be done at the time of operating. The infected area should most certainly be cleaned out, along with any broken process and septic granulation tissue, before the operation is considered finished.

VALUE OF CURETTEMENT

Mertz says that it "hastens healing, reactions lessened for infection, reduces load placed on system in bringing elimination of pathology and healing of the diseased area." Shepard says that curetting "often saves considerable time for operator and patient."

Referring once more to the treatment of residual areas, we find these statements. "Had cases of systemic disturbance clear up by opening and curetting." (Francis.) "Eliminated certain systemic diseases by opening and curetting old sockets in locations operated before curettement was started." (Browning.)

As the chronic case associated with some lesion in the body continues to drain into the body fluids even after removal

of the tooth, by eliminating the residual areas at the time of operation this constant source of infection is the more quickly done away with. When curettement is carried out properly, with few exceptions it obviates a second operation.

Russell L. Haden, in a letter to Harry M. McFarland, refers to the results of noncurettement:

> It is regrettable that patients are assured of relief when the damage done is permanent and it is too late. Septic teeth and tonsils are removed too often with the assurance of benefit to the patient after the heart has begun to beat irregularly, after albumin or pus has appeared in the urine or after the joint has become deformed. Strange as it may seem, the idea that normal function can be restored to an irreparably injured kidney, a deformed joint or leaking heart valve, by removing a focus that initiated the disease years before, is apparently the most common misapprehension regarding focal infection.

CONSENSUS OF OPINION

"To not maintain drainage after the acute case is as foolish as not to curet the chronic one after one has access to it." (Hume.) "A surgeon will not leave necrotic bone in other bones, why should we?" (Francis.) "In many conditions, bone fails to get well unless curetted." (Mertz.) "Have seen many hangovers result in rather serious conditions." (Boydston.) "Many areas of cystic and residual infection are proof for the need of curettement." (Seeman.) "Cannot remember any trouble after curetting of chronic case." (Eggers.) "It is suicidal to curet in acute conditions." (Hume.) "Found that areas showing a rarefied area not circumscribed will regenerate more readily if curetted." (Ober and Pursell.) Babcock writes in his new book (1929): "By eliminating the source of bacterial supply, provided the defensive mechanism of the body has not broken down, bacteria rapidly disappear from the blood."

I have operated in many areas in mouths that have carried dentures for years. The reflexes were pronounced in some cases, to a degree making the constant wearing of plates most uncomfortable. Postoperative results are most gratifying in the majority of these cases, since they admit of relief or complete correction of the disturbance.

THE ROENTGENOGRAM

Neglect to examine by the roentgen rays all teeth to be removed presents an outstanding reason for resulting residual areas. It is my practice to re-examine every case after operating and before the patient is dismissed. If the patient objects to having roentgenograms made before operation, he is told that if the operation is performed without them, he must assume all responsibility connected with the surgical procedure and any possible postoperative complications.

SUMMARY

1. Sufficient drainage is established in the acute case by removing the tooth. Re-examination by roentgen rays should be made after the acute symptoms have subsided, operation being performed later if necessary.

2. The dental granuloma is directly connected with the humoral factors of the body: if it is not removed, drainage continues in the blood stream. Leaving such a condition often results in a residual area.

3. The absence of local symptoms around infected teeth apices does not necessarily mean the absence of infection; neither does the negative roentgenogram conclusively prove absence of infection.

4. The roentgenogram is a prerequisite to all surgery of the mouth, cases being examined before and after operation.

5. Curettement judiciously used saves the patient time and disconcerting reactions in the period elapsing between operation and restorative procedure. It accomplishes, at the time of operation, what Nature does over a long period of time or often fails to do.

6. When correctly carried out, curettement will not be followed by any untoward postoperative trouble; neither will it cause swelling, fever, pain or any of the reactions associated with an inflammatory process.

In connection with this subject, we would all do well to ponder the admonitions of Dr. McFarland: "The fact is that the dental profession generally is not sufficiently interested in the general health and welfare of their patients. We have a duty to perform and a heavy responsibility. The old method of simply pulling teeth is doomed to be a thing of the past. We must take care of the associated pathologic conditions."

I realize that there are exceptions to nearly all laws and statements. Eighty-five replies were received in answer to 130 letters sent out inquiring as to the recipient's stand on this question. Only three of these replies expressed skepticism regarding curettement, an overwhelming balance of opinion in favor of skilful curettement.

846 Metropolitan Building.

THIRD MOLAR INTERFERENCE*

By P. E. SPENCER, D.D.S., Waco, Texas

ORTHODONTIA as a specialty is still in its infancy. Yet we are rapidly approaching treatment from the angle of prevention, rather than from the opposite direction. From a vague theory of the normal, we are, I hope, beginning to realize first what should be normal to each individual. To prove the fallacy of our past advanced thought, we have only to make an unbiased study of our failures. A few years ago mechanics covered all orthodontic procedure, and in some locations this condition remains unchanged. The more vicious the appliance, the more marked the so-called positive action, the greater the repression of every normal tendency; yet such procedures are termed 100 per cent perfect.

After a decade of experimenting and heedlessly shifting teeth *en masse* and otherwise, we note a sudden trend of our literature to a consideration of root resorption, muscle exercises, diet, apical bases, endocrine imbalance, gymnastic sleeping postures, simonizing, and many other subjects; and, following thereafter, orthodontic education. Just what prompts these changes in our literature, if it isn't a summing up of our failures?

Since the beginning of time, the swiftly changing conditions, whether or not a mark of progress, and termed civilization, make it positively necessary that compensating changes occur.

Orthodontic interference should be such that it not only corrects defects, if

*Read before the Section on Orthodontia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 23, 1930.

possible, but with the improved conditions, promotes continued progress after the case is dismissed. Without some positive assurance that the third molars will erupt properly and serve normally, some provision must be made to prevent their being a direct hindrance to the normal functioning of the other teeth of the arch.

May I ask you to note the faces in this room? What percentage of dentures do you suppose have third molars in position or have room for them, and in how many has it been found necessary to have these molars removed? To simplify the problem, let us agree that not a single man attending this meeting has ever received any orthodontic treatment, admitting that, with treatment, ample space might have been provided. Then let us examine the casts in our offices of patients of 12 and 14 years of age, and note the position of the second molars, and the percentage of lower second molars that are being rotated lingually. Next, let us examine the casts made a few years after treatment, in patients of 15 or 18 years of age who do not yet have fully erupted third molars. What has happened? And what is going to happen? It is all very conducive to our peace of mind to say that the third molar normally has sufficient space, or that space will develop, or has developed during eruption. A survey, the past four or five years, of several thousand adult mouths, and also examination of treated cases in various orthodontic practices make it very doubtful that even 10 per cent of those examined have or ever will have sufficient space for normal function of the third molars. If only the occlusal surface erupts, and if we are satisfied to have with us continually the pathologic gum flap, or if the future position of the lower third molar is to be on the internal surface of the ramus, we need not worry about the third molar problem. Roentgenograms of lower third molars made from the proper angle should show two thirds or more of the occlusal surface, anterior to the external oblique ridge; otherwise, the above mentioned condition will always be present.

The age of the patient and the position, size and type of unerupted teeth, all dependent on the type of malocclusion, make each case a problem unto itself, and make it impossible for any set rule to govern any case except in a general way.

Systematic, periodic roentgenographic examination for several years prior to the eruption of the third molars, beginning as early as the twelfth year, will disclose the following: 1. When the plane of occlusion of the first and second molars is noted, it becomes evident that, in nearly all open-bite cases, the third molars, both lower and upper, are a local factor in the malocclusion. 2. In all cases of mesioclusion, the lower third molars, with few exceptions, tend to defeat the result we hope to accomplish through treatment. 3. In all cases of distoclusion, the lower third molars are, at least during treatment, a decided help in treatment.

After we have stimulated development to the fullest possible extent, how often have we, a few years after treatment, noted crowded incisors? Is it a coincidence that the third molar is just making its appearance? I hardly think that we can attribute such crowding to improper muscular function, sleeping posture and whatnot.

By any method of reasoning, diagnosis, measurement or even the use of mystic powers, we note that, in numerous types of distoclusion, the patient never has had or never will have sufficient space to accommodate thirty-two teeth. At least that amount of tooth structure will not be in harmony wih that particular person's facial outline. I grant you that we are

often able to present very pleasing casts with third molars in ideal occlusion. But let us note some of these fully equipped natural dentures. What are we going to do about it? It is good practice to shorten a wagon tongue by removing the center section?

If we believe our instructors in phrenology, we realize that, with the growth of the brain chamber and mental progress, there is also a recession of the lower third of the face. The lessened effort necessary to secure our food as compared with conditions several thousand years ago is making the third molar problem a very positive fact.

A questionnaire sent to a number of orthodontists a few years ago relative to the third molar problem brought the information that from 5 to 95 per cent of patients had insufficient space for proper functioning of the third molars. My experience has been that in not over 5 per cent of treated cases is there sufficient space for third molars.

Examination of several thousand negroes showed true blood types having ample room, and a small percentage with four molars. With the mixing of types, a noticeable amount of space was lost.

TREATMENT

Each case is a study in itself. Removal of any tooth must be preceded by careful study of that particular individual's needs. In a majority of cases, depending, of course, on the roentgen-ray findings, it is possible, even up to the age of 17 years, and sometimes in older patients, to remove the second molar in the upper arch and permit the third molar to erupt into proper position. This procedure would be possible in most open-bite cases, also a large percentage of distoclusion and those types of mesioclusion cases that also have a tendency to become open-bites. Roentgenograms in such cases show the upper second and third molars to be producing an elongation of the first molar. In the lower arch, an entirely different problem is presented. The position of the unerupted third is seldom such that it can be utilized to replace the second molar. It would be necessary to remove the second molar very early, at least several years before the normal eruption of the third, to be assured that the latter would erupt into the desired position. The removal of the lower second molar might be of decided advantage in extreme cases of mesioclusion.

The importance of surgical removal of impacted third molars is not a passing fancy of the exodontist, but rather, in recent years, this molar has been properly recognized as a disturbing factor in many other ways than from an orthodontic standpoint. Observations made a few years ago at one army camp where thousands of men, recently drafted into service, were placed on rations requiring increased mastication, showed that over 60 per cent were subject to some form of third molar complication, an average of 250 to 500 reporting weekly at the dental infirmary for treatment. One must bear in mind that the majority of these men were at the age when the third molar often makes its appearance. Yet it was an awakening fact to anyone directly out of private practice to note that in dentitions that were otherwise above the average in freedom from dental ills, there was such a high percentage of men suffering from third molar impaction.

If, through lack of function, Nature is endeavoring to carry out a process of elimination, we can safely prophesy that the orthodontist a few thousand years hence will find real joy in his practice, for, when the normal dentition numbers a scant half dozen teeth, and with the

continued progress shown in the newest and best orthodontic appliances, surely it will be a simple matter to secure 100 per cent perfection in all cases.

BIOLOGIC CONDITIONS IN RELATION TO HEREDITY AND ENVIRONMENT AS REGARDS SIZE, FORM AND HARMONY OF OSSEOUS AND DENTAL STRUCTURES*

By C. N. SKINNER, D.D.S, Los Angeles, Calif.

IT is our inheritance, as members of a healing profession, to know the biologic facts that we are dealing with and of what every living thing is composed, man representing the ultimate highest type. We are aware of the laws that govern existence, life and the movements of the universe. It is these laws, when fully understood, that give us greater power and a wider use of the various factors concerned. The greatest outstanding factor that has been observed as to the law of heredity and its constancy of form is our own actual being. Is it not a marvel how we begin our existence, continue our growth and development from a minute miscroscopic cell until we become a fully developed individual? (Fig. 1.)

Can you imagine that out of the billion and a half people that live in the world the structures all develop harmoniously; nerves, bones, foramina, and the various organs of the body. Is this not proof of heredity? Can you realize that the ova required to produce one billion and a half population could be put into a two gallon bottle (estimate by Professor Muller) and that the number of spermatozoa required to fertilize this same group of ova, if placed close together could be covered by two pinheads (estimate by Professor Muller)?

It has been very ably said that the material which constitutes the fertilized human ovum is probably the most remarkable in the whole universe. In this microscopic speck are locked up all of the remarkable possibilities, both physical and mental, of the human species. The fertilized cell divides into two cells, each having a nucleus composed of similar chromosomes as in the original cell. These two cells grow and again divide, forming four cells, eight, sixteen, etc., until the billions of cells are formed that compose the individual. Biologists have credited this to the particular chromosomes contained in the nucleus of the cells which are inevitably the hereditary characters of the species. (Fig. 2.)

The ovum and the spermatozoon each have forty-eight chromosomes. Previous to fertilization, they go through what is called a reduction division, in which the ovum gives off polar bodies, containing one-half the number of chromosomes. The spermatozoon cell also goes through a reduction division. These are now capable of and ready for fertilizing the ovum, which completes the number of chromosomes for a human being. You can

*Read before the Section on Full Denture Prosthesis at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 22, 1930.

readily see that the individual has characteristics coming from both the maternal and the paternal side. As a result, the offspring is affected by influences from two or more different characters. It may look like all of them or one of them, or may look different from either of them. There may be one or a multiple of genes that influence a particular form or character. (Figs. 3-6.)

The year 1822 was an eventful one in the annuals of biology. Pasteur and Mendel were born during that year. Pasteur's discoveries revolutionized medicine and surgery. Today, everybody knows the relations of germs to infectious diseases. The name of this biologist

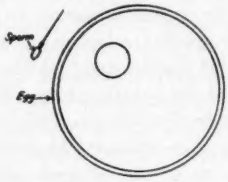

Fig. 1.—Human sperm and egg cell (high magnification).

has become a household word. It was Mendel's work which changed the study of heredity from chaos to an exact science. He crossed various types of peas which differed in regard to flower color and texture. He then followed the distribution of these characters among the offspring of the hybrid. In short, it was found that the characters that appeared in the parent of a hybrid reappeared again among the offspring of the hybrid. He also found that there was a definite ratio in which these characters appeared. In this particular case, there were three yellow to one green, the hybrid itself being yellow, or one pure yellow as the original, two yellow which were hybrids and one pure green. (Figs. 7-8.)

The rule of dominance as to color does not always hold true. It has been found by other experimenters who grew four-o'clocks that the hybrid, instead of being one of the pure colors, was a color combined of the two. For example, four-o'clock red and white flowers were crossed and the hybrids were pink. If it were true that the color genes united, there would be only pink flowers reproduced from the hybrid, but as a result of the crossing of these hybrids, it was found that they produced both pure white and

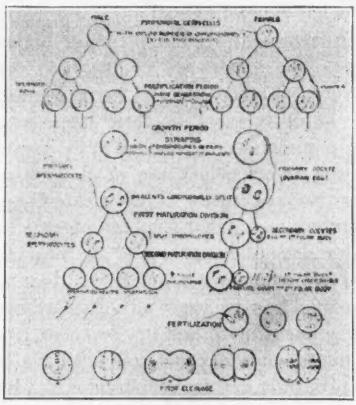

Fig. 2.—Cell division growth and development in early stages, beginning with fertilized cell which develops into two, four, six, eight, etc.

pure red and pink in the same ratio. (Fig. 9.)

The crossing of the short-winged fly with the long-winged produced a hybrid, one that contains both the long and the short wing genes in their chromosomes. The hybrids referred to produced offspring in the same ratio as was found in plants. (Fig. 9.)

It would have been impossible to arrive at Mendel's principles if these studies

had been confined to man alone. Nevertheless, because man is the most important animal, the signs of heredity, as well as other signs, can justify their existence only as far as they ultimately contribute to a better understanding of man himself and to his welfare and happiness.

There may be some interest pertaining to the hereditary basis of sex. Sex is not controlled except through the chromosomes or the genes that produce the male or female and all of the experiments that have been performed and drugs that have been given, etc., to determine and develop the sex desired have failed, it having been proved that the individual is male or female potentially from the time fertilization takes place.

The chromosomes are paired. The female has twenty-four pairs and these chromosomes that are sex determining are designated as x chromosomes. In the male, they are not all paired. There are twenty-three pairs besides the x and y chromosomes which are sex determining. (Fig. 14.) It has been shown that when the x chromosomes given by the female are paired, there is always an x chromosome in the ovum during the reduction division. As the spermatozoon goes through its reduction division, there are both x and y spermatozoa which may fertilize the ovum. If an x ovum is fertilized with an x spermatozoon, the sex of that individual is female. If the ovum is fertilized with a y spermatozoon, the individual is a male.

There are conditions in sex determination that are sex-linked. It has been found that color blindness is more prevalent in the male than in the female. It is usually transmitted from the male through the female to the grandson. (Fig. 15.) It is also to be noted in connection with color blindness that there are other sex-determined diseases, such as hemophilia and night blindness. Both of these defects are recessive to the normal conditions.

It has been stated that if some external

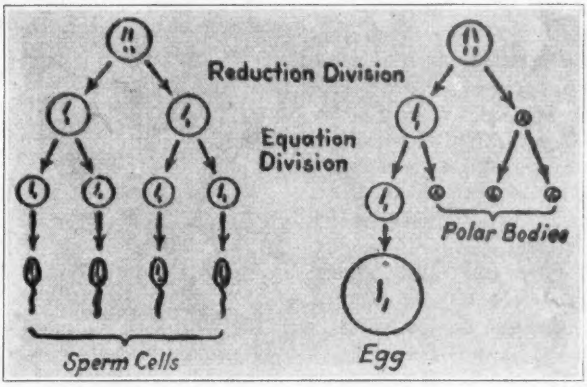

Fig. 3.—Division in both male and female and of polar body formation in female, during reduction division. The ovum and spermatozoon each contain one-half the number of chromosomes after the reduction division. When fertilization takes place, the total number of chromosomes are maintained.

influence acted on a race generation after generation, it would become inheritable, but from observations it seems that the hereditary factors are those that are constant. There are changes in races of people and in animals, and these are explained from the fact that a mutation has occurred. In experiments with the drosophillum, a number of mutations occurred, and from these a new and true species developed, showing that it has not been brought about by any external influences, because they have all been grown under similar conditions.

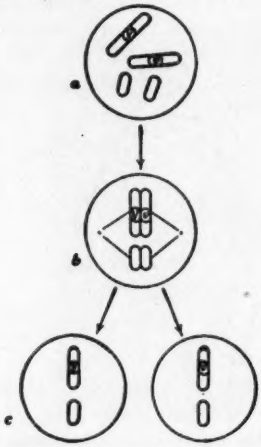

Fig. 4.—Reduction division in nonvestigial and vestigial hybrid. The allelomorphs have become separated, vestigial from nonvestigial. When the reproductive cells develop, half of them retain the nonvestigial gene and the other half the vestigial gene. This numerical relationship follows because the reduction division forms the two types of cells in equal numbers.

There has been an attempt to explain that the color of the dark races has been caused by their contact with the sun's rays, but this does not seem to hold true. We may say that external influences may act as a selective agent, in which case, of course, the selective agent eliminates those species that are not capable of living or of adapting themselves to their environment. As far as it has been determined, acquired characteristics are not inheritable; that is, it is impossible for any of the external influences acting on the somatic or the body plasm to have any effect on the germ plasm. It was thought at one time that the cells of the body that produced the next generation came from all of the cells of the body, from the muscles, nerves, etc., of the individual and went to make up the reproductive cells, but this is not true, as is shown from microscopic study of the lower forms of life and even of the higher. It is known that

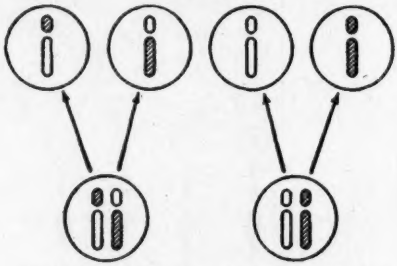

Fig. 5.—Graphic example of reduction division showing two possible ways for the chromosomes to aline themselves when there are two pairs.

mutations occur and that the causes of these are unknown at the present time.

Any breeder knows that if he takes pure bred stock and crosses it with another species, the generations following will not be true to form. They may appear like the normal or they may be different, because the genes from the two parents are different and, by the process of fertilization, the combining of one type with the other will cause the various characters to develop in the offspring.

There have been many experiments performed to determine whether acquired

characteristics are inherited. For example, Professor Weismann[1] (German biologist), in the latter part of the nineteenth century, cut the tails off of rats for a number of years, endeavoring to see if taillessness would become an inherited characteristic over a period of time, but as far as he carried the experiment, it had absolutely no effect. Over a period of many generations, the act of circumcision has been practiced among the Israelites.

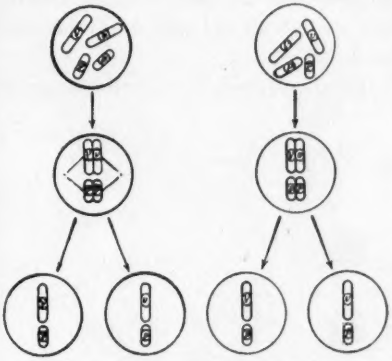

Fig. 6.—Reduction division in a hybrid containing genes (*V*) that are nonvestigial and (*v*) vestigial wings and (*P*) red eyes and (*p*) pink eyes. The result is that the hybrid forms four types of reproductive cells: (1) *V.P.* nonvestigial wings and red eyes; *v.p.* vestigial wings and pink eyes; *V.p.*, nonvestigial wings and pink eyes; *v.P.*, vestigial wings and red eyes. If these types are arranged in a certain order and classified, the 9:3:3:1 ratio is obtained, as Mendel observed in his peas. If the genes for arch sizes, arch forms, osseous forms, tooth forms and profile forms were substituted in these graphic representations for those of the fruit fly, the same types of reproductive cells in the human species would be comparable. From these basic principles of heredity, it is definitely proved that the combinations and variations in the osseous and dental structures have occurred as the result of the various types of crossing in the human being.

1. Weismann, August: Essays on Heredity, Vols. 1 and 2.

The results show definitely that acquired characteristics are not transmitted through heredity.

It is interesting to note that reproductive cells do not mutate possibly as easily as other cells of the body. It is of particular interest to note that the naval orange arose by a mutation that occurred in the branch of an ordinary orange tree, and that all of the navel oranges which are produced at the present time have come from the mutation that occurred in one branch of the original tree. It is improbable that mutations are transferred to their offspring, unless they have affected the reproductive cells themselves; and, of course, this mutation would last as long as the tissues lasted, and, in case it did not affect the reproductive cells, would naturally die when the body died.

In looking at the mutations that have arisen and that may arise in the various species of animals and plants, we note that, on the whole, only the fortunate mutations have been saved. The selective activities have caused only the most progressive and most adaptable to be reproduced. It is because of this that the race has evolved and that we do not have more mutations, more mental defects, deformities, etc. The best of mutations that have taken place give the various characteristics and racial species that exist at the present time. Mutations take place within the microscopic dimensions of a cell, and may spread by reproduction until they cover the face of the earth. It is haphazard and blind in its occurrence and motive, but it is the very process through which the wonderful array of life forms in the past and present have come into being, and it is therefore at the bottom of evolution itself.

It has always been stated that inbreeding is not good. Blood relatives, it is assumed, are apt to have defective children.

It has been observed that most animals outbreed; in fact. the hermaphrodites, which are both male and female, such as snails and earthworms, are incapable in many respects of self-fertilization. Self-fertilization would represent the closest form of inbreeding, and we find this in the plant kingdom, especially the pea family. Consider also the practice of animal breeders; the best breeds of horses, dogs and other domesticated animals are usually closely inbred. The breeder of a thoroughbred horse knows that he would lower the quality of his highly selected stock by introducing into it the blood of some outside strain.

This can be explained by the fact that parents carry recessive genes. There must be a differentiation between two types of normal people: first, pure normals; second, apparent normals. An apparently normal person may be a hybrid carrying the gene of feeblemindedness. If two hybrids mate, it is possible that their offspring may have the gene combining to form a defective individual. They also have normal children, some of them that are pure normals, others that are hybrids and still others that are feebleminded.

The gene cannot be made to disappear

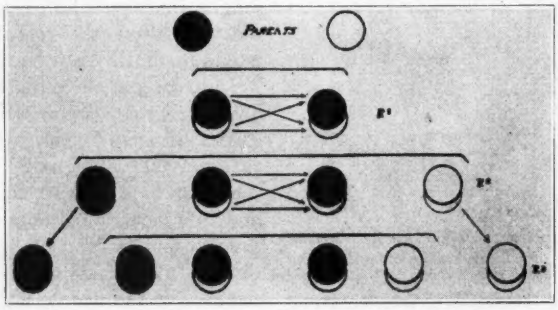

Fig. 7.—Segregation and recombinations of factors (black and white) in the gametes, and the presence of both in the hybrid F^1 The parents are black and white. The F^1 generation is represented, showing both the black and white, black being dominant. F^2 generation shows one pure black, two black hybrids and one pure white. F^3 generation shows two pure blacks, two black hybrids and two pure whites.

One of the practical results of the mutation theory and Mendel's principle has been to offer a final solution to this ancient problem of inbreeding. Consider a specific case: Two people marry who are closely related, both of them apparently normal. They have mentally defective children. If either or both of the parents had been defective, it would naturally be assumed that it was because of a hereditary condition that this occurred. by outbreeding; it is simply under cover, so to speak. Note also that inbreeding did not cause the production of the gene for feeblemindedness, but it simply allowed the two genes to come together and to express themselves. Outbreeding prevents this result, because it is likely that the outside parent will contribute a normal gene to all of the offspring, and thereby will prevent the gene of feeblemindedness from expressing itself in any

of the offspring, because the normal gene is dominant.

Through inbreeding, not only do bad qualities express themselves in the offspring, but also any good qualities that are dependent on the receptive genes come to the surface in the same way. Outbreeding, on the other hand, would tend to prevent the appearance of highly desirable traits that are rare, because the outside progenitor in all likelihood would not have the exceptional gene. It would have instead some dominant gene that would prevent the expression of the good one, thereby preventing the desirable character from appearing in the offspring.

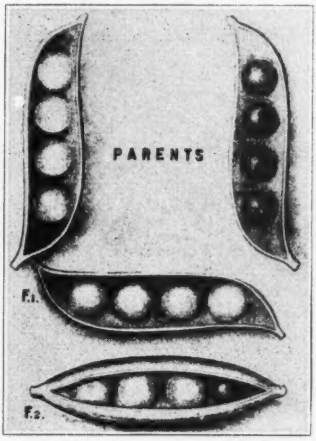

Fig. 8.—Mendelian inheritance from crossing of yellow and green peas. The parents are yellow and green. The F^1 generation is a hybrid containing both the yellow and green color genes; yellow being dominant. F^2 generation presents one pure yellow, two yellow that are hybrids and one pure green. This will continue in the same ratio as the diagram of black and white in Figure 7.

Up to this point, there is really no case against inbreeding. The mendelian analysis shows that the process by itself does not produce the gene for feeblemindedness, nor for any other bad trait; but it may seem possible that it has allowed the bad genes to become more numerous than if outbreeding took place. Any receptive gene that was the basis of a good trait could, by means of inbreeding, be made to come to the surface, if it had been previously concealed by a dominant allelomorph in the hybrid. Inbreeding does not in itself favor one gene rather than any other, even though one is for a good trait and the other for a bad trait. It does eliminate hybrids from the population and substitute the pure types for them. Just how this production of the pure types comes about through inbreeding can be shown best with the hermaphroditic plants. (Fig. 16.)

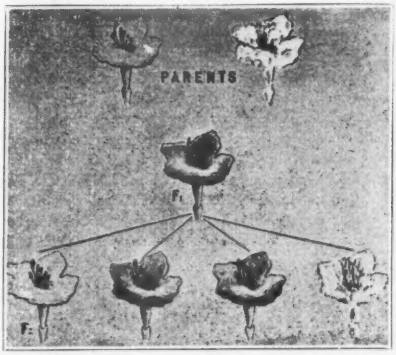

Fig. 9.—Example of mendelian inheritance in which hybrid (F^1) is intermediate in color between two parents, but showing segregation of two factors in germ cells, giving in F^2 generation proportion of one pure red, two pink that are hybrids and one pure white. The crosses made between white and red races of mirabilis jalapa (the four-o'clock). The hybrid F^1 is pink, and these when inbred give white, pink and red flowers in the proportion of one, two and one (F^2).

Consider a plant that fertilizes itself, the four-o'clock. These four-o'clocks,

when crossed, one with red flowers, another with white, give us hybrids that are pink. If these are inbred, they will give the ratio one pure red, two pink and one pure white. When the hybrids are crossed again, there are obtained one pure red, two pink and one white. These red and white plants that come from the inbreeding of the hybrids are both pure and can produce nothing but their pure forms.

Note that, in each generation, the pure

Most animal species are bisexual. As a result of this fact, the species outbreed, to some extent at least. The offspring of one family, as a rule, separate and mix with the generation before they reach maturity and cross with some outside strain. Their parents did the same thing and, as a result, the offspring are hybrids.

The various highly selected race horses and other domesticated animals are not so very adversely affected by inbreeding,

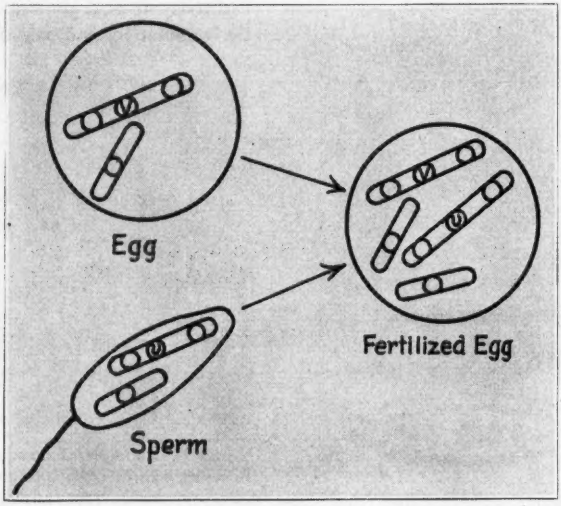

Fig. 10.—Chromosomes and genes in cross between (*V*) long-winged female and (*v*) vestigial or short-winged male. Not all of the chromosomes or genes are shown. The fertilized ovum in this example contains two genes, one for long-winged and one for vestigial, the result of which is a hybrid.

reproduce 100 per cent, but the hybrids reproduce only 50 per cent of their own type, the other 50 per cent being added to the ranks of the pure.

Inbreeding on the part of human beings would have the same results, the elimination of hybrids and the production of approximately pure types.

because they have become comparatively pure by this process. In short, inbreeding allows natural selection to operate on receptive genes; outbreeding does not. For this reason, inbreeding has an advantage over outbreeding. It also has a disadvantage: it does not allow the introduction of good mutations from out-

side strains. It is here that outbreeding has its advantage. Where two distinct strains possess certain good qualities that are alike, and one of the strains possesses good qualities which the other lacks, all of the good qualities will appear in the offspring by the process of outbreeding.

The outbreeding process has made the human race hybrid to a marked degree. Biologists say that the pure Nordic type or any other pure type among human beings is pure fiction. Were there any such thing as a pure type, it would constitute a perfectly homogeneous group. The children in a family of a pure type would all be very much alike, because there is no genetic variation within a pure line. For the present, it will at least be evident that Mendel's discoveries have put an end to the confusion of ideas that previously existed on the subject of inbreeding.

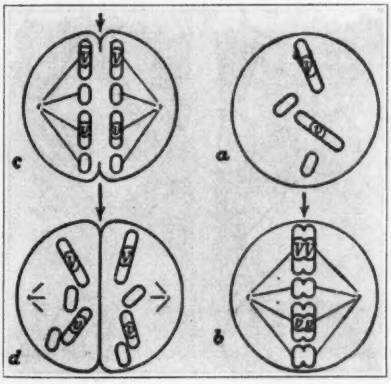

Fig. 11.—Division of fertilized egg having *V* (nonvestigial) and *v* (vestigial) genes. The diagram includes only two pairs of chromosomes and the genes *V.v.* The growth and division of the genes with constriction of the cell give two cells like the parent.

One advantage that sexual reproduction holds in the way of hereditary benefit is the possibility of the grouping of good genes from two different types of races; whereas, in asexual reproduction, we have only the offspring from that particular type. We find that the breeders of plants, in an effort to maintain a particular species, because the seeds would develop plants according to their genetic composition, make grafts and buddings, rather than grow their trees from seeds. If the plants were hybrids and produced asexually, it would mean that they would always be the same, that that particular genetic relation would remain constant.

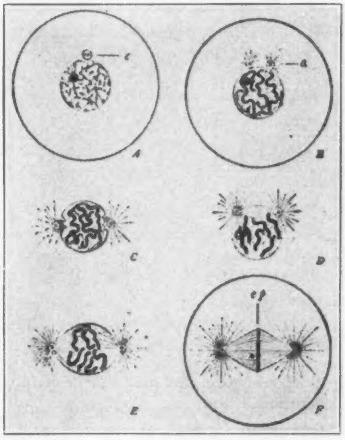

Fig. 12.—Early stages of mitosis. *A*, resting cell and nucleolus. *B*, early prophase. *C* and *D*, two later stages in prophase with chromosomes. *E*, formation of mitotic figure, with centrosomes at poles and chromosomes split longitudinally; *F*, mitotic figure fully established.

So far, there are two advantages in the sexual method of reproduction: 1. It makes possible the concentration of good mutations. 2. It makes possible genetic variability.

Twinning and regeneration have an

important bearing on the biologic factors of heredity. Their relation to heredity will prove many points that are applicable to development and form in human life. The production of twins in the human race does not indicate, as is sometimes supposed, exceptional virility on the part of the male parent, but is ordinarily dependent on the female and the production by her of two eggs at one ovulation. It is usual for one of the graafian follicles to develop, burst and release one ovum into the uterus, but it seems that, occasionally, two follicles mature at the same time, which would account for the

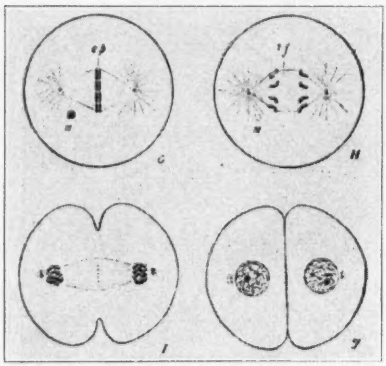

Fig. 13.—Middle and end phases of mitosis. *G*, metaphase showing longitudinal split of chromosomes. *H*, end phase with daughter chromosomes separating. *I* and *J*, final stages in daughter nuclei formation, and division of cell.

occurrence of twins in the human race. In brief, twins may be produced in two ways; either by the simultaneous ripening of two eggs in separate graafian follicles, or more rarely by the growth of two eggs in the same follicle.

What has just been said applies to twins of the ordinary kind. You have probably noticed that some twins resemble each other very closely. They are of the same sex and are so much alike that it is difficult to tell one from the other. They are called identical twins in distinction to the ordinary or fraternal twins. Their mode of origin is different from that of the type just mentioned. Identical twins were one at the start; they developed from the same fertilized egg, but became two in the course of development. The egg either divided, or in some other way gave rise to two parts, each of which developed into a complete individual. It is not merely their com-

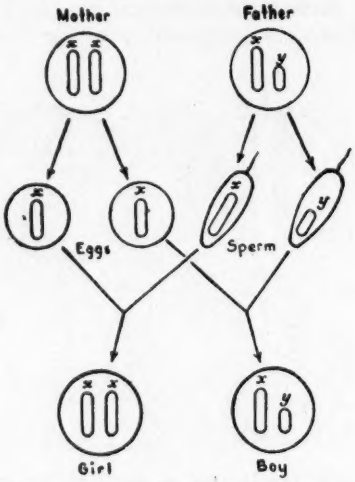

Fig. 14.—Sex determination. The mother has x sex chromosomes paired; the father has x and y sex chromosomes not paired. These x and y sex chromosomes are produced in equal numbers in the reduction division of the sperm cell. When the x chromosome of the mother is fertilized with the x chromosome of the father, the child will be a girl. When the x chromosome of the mother is fertilized with the y chromosome of the father, the child will be a boy.

mon origin that makes identical twins alike, but rather their genetic form. Identical twins have exactly the same kind of chromosomes and genes, the kind

that the fertilized egg had. They are, so to speak, hereditary duplicates and are accordingly replicas of each other in adult life. That this explanation of the origin of identical twins is correct is indicated by studies on lower animals, especially the armadillo.

The membranes that surround the developing embryos give further evidence of their origin. Twins of the ordinary kind are surrounded by separate membranes, the chorion, each developing egg forming its own membrane; but, since, in the case of identical twins, the embryos have just one membrane in common, presumably they develop from one egg. It has been suggested that the egg divides into two cells in the usual way, but that the two cells separate from each other and develop, not into the left and right half of the body as they would do if they had remained together, but independently, to form a complete embryo. Possibly, the separation of the right and left halves does not occur at this very early two-cell stage, but at a somewhat later stage of development. It is also conceivable that a small mass of cells is produced from the left and right halves from which a bud grows, very similar to that of the armadillo, and that each

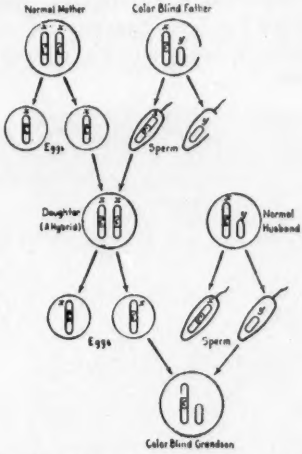

Fig. 15.—Transmission of gene of color blindness from father to grandson, through daughter. A normal mother has the x chromosomes with the normal genes, a color blind father has the x chromosome with the gene of color blindness. The y chromosome does not carry the gene of color blindness. When the x chromosome with the normal gene of the mother is fertilized with the x chromosome of the father having the gene of color blindness, there is developed a daughter that is a hybrid, that is, she carries both the normal gene and color blindness gene, the normal gene being dominant. If the hybrid daughter has mated with a normal husband and the x chromosome of the mother containing the color blindness gene is fertilized with the y chromosome of the father, the result will be a color blind grandson. Not all the possible combinations of reproductive cells are shown, but only those that show how the gene is transmitted to the grandson.

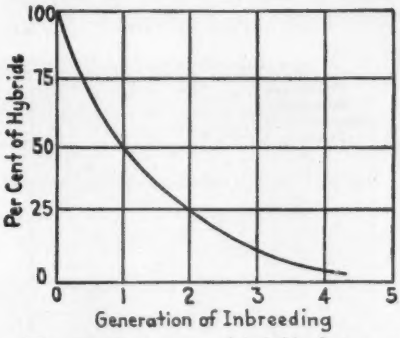

Fig. 16.—Percentage of hybrids from one generation to the next as result of inbreeding. The vertical numbers represent the percentages of hybrids. The horizontal numerals represent the number of generations. In the first generation of inbreeding, the hybrids are reduced 50 per cent; in the second generation of inbreeding, the hybrids are reduced 25 per cent, and in the third generation of inbreeding, the hybrids are reduced 12.5 per cent. The hybrids are reduced about one-half in number in each generation.

bud gives rise to an identical twin. In any event, the mode of production of identical twins would be substantially the same: they would come from a single fertilized egg, which, by division into separate parts, at an earlier or later stage or by a process of budding, would give rise to duplicate embryos, the future identical twins.

Biologists have performed experiments with lower animals producing identical twins. In the frog, the fertilized egg divided as usual to produce the first two cells, which ordinarily develop into left and right halves of the body. If the two cells are separated from each other, each may develop into a complete tadpole, identical twins resulting.

Siamese twins are a special form of identical twins. They develop from the same fertilized egg, but they do not complete their separation from each other. In a similar way, monstrosities are produced according to the different degrees of separation taking place between the right and left halves of the body when the individual is an embryo. Siamese twinning has been demonstrated experimentally in lower animals, especially in the fish.

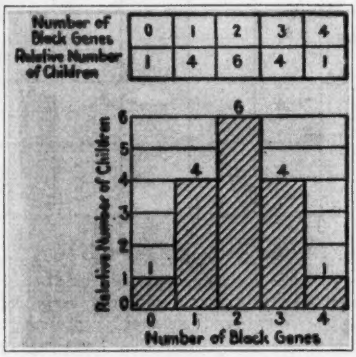

Fig. 17.—Distribution of children produced by mulattoes, according to mendelian classes. When there is no black gene, the relative number of children is one; when there is one black gene, the relative number of children is four; when there are two black genes, the relative number of children is six; when there are three black genes, the relative number of children is four and when there are four black genes, the relative number of children is one. The lower figure is a graphic representation of the data shown in the upper figure. This would show that the black and white color genes do not mix; they vary from light to dark, the greater number having the black and white genes in approximately equal proportions.

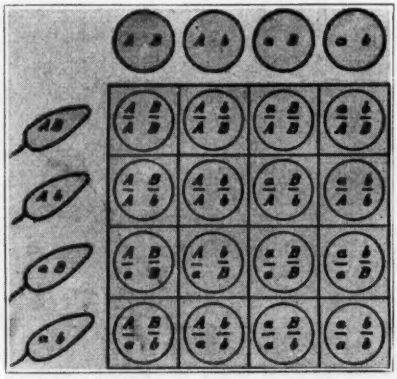

Fig. 18.—Combinations between reproductive cells of mulatto. This shows four types of reproductive cells in the ovum represented as *AB, Ab, aB* and *ab*; and four types of the reproductive cells in the spermatozoon represented as *AB, Ab, aB* and *ab*. Through the possible combinations of these spermatozoa and ova, there are approximately sixteen different variations in degree. This would explain the graphic figure shown in Figure 17.

The production of identical twins has a connection with the healing of wounds. All living substance has the capacity of healing and replacing parts lost through injury. Human beings have a rather restricted capacity for regeneration. It is

limited mostly to the growth of new skin over a wound. The lower animals that have been under observation can lose a relatively large part of the body and replace it. A starfish can replace any of its five arms; an earthworm will replace a lost part. A very young embryo has extensive powers of regeneration, if it is at a sufficiently early stage of development. It can repair an injury, so to speak, that involves half its body. In other words, it can replace the lost half. The result then is a case of identical twins, if each half replaces the lost half. It is evident from a case of this kind that asexual reproduction is substantially the same thing as regeneration. All developments asexually are similar to those of identical twins. They agree with identical twins in their mode of origin: they are derived from the same fertilized egg. In the production of identical twins, the embryo fragment regenerates. In asexual reproduction, it is the adult frgament that regenerates. The same process takes place in both cases, but it simply takes place at different stages of development.

Similarity in the hereditary make-up of identical twins extends to the minute particles that constitute their bodies, the cells, for within the cells are the chromosomes, the rod-shaped bodies that make us what we are. And going still farther, we have the genes within the chromosomes, which are the ultimate units of heredity. It is these genes that are all alike in identical twins. Ordinarily, no two persons would have exactly the same kind of genes, but identical twins are the exception to the rule. Their cells and genes are alike because of their common origin. Almost all of the cells of the body are derived from the fertilized egg by mitotic cell division and are on this account genetic duplicates.

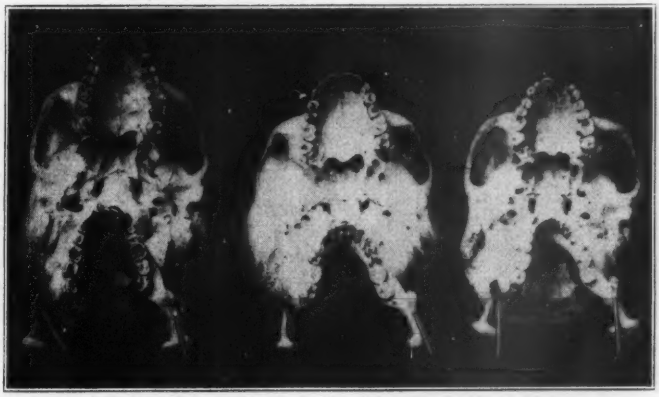

Fig. 19.—Three typal arch forms with slight degree of variation; ovoid, square and tapering.

The embyro at an early stage of development is a rather formless mass of cells, undifferentiated. What causes some of the cells to develop into arms, others into legs, others into eyes, others into teeth, ears, hair, etc? Consider for a moment the very young embryo at a two-cell stage in its development. The first two cells ordinarily develop one into the

left side of the body, the other into the right side, as happened, for example, in the experiment with frogs' eggs. But separate them, and each develops into a complete embryo. This shows that one and the same cell can develop either into a half, a part or the entire body. Let it remain in contact with another cell, and it develops into a half; separated from the controlling influences of other cells, it develops into a complete individual.

Margaret M. Hoskins,[2] of New York University College of Dentistry, carried out experiments to determine the effects of acetyl thyroxin on white rats. She found the development normal in character, but abnormal in rats. It was concluded that the fragility of the enamel seen in hypothyroid patients is the result of disturbed metabolism and not a developmental anomaly. This would show that the genetic power of the cells is greater in the case of form than the degree of calcification. Remember that development is a highly complicated process, subject to all sorts of conditions, such as contact, and to the internal secretions. These factors determine which of the numerous possible paths the cells will take in development. The various possibilities reside within the cells itself and are dependent on what is probably the most highly organized material in the universe —the substance that constitutes the chromosomes and, in particular, the genes within them—the ultimate units of heredity.

It was thought that when the black and white races crossed, there was an intermixture of the blood. This appeared in no way connected with Mendel's hybridization experiments with plants, for when he crossed plants, he obtained pure types and hybrids, and as long as he continued this experiment, there were produced the pure types of the species and also the hybrids. It would appear from the crossing of black and white that this is not true. One thing to be remembered in Mendel's crosses with plants is the fact that he did not consider any of the other genes which were within that particular species. There was only one genetic difference noted between the species.

In the human races, there are many conspicuous genetic differences. If we confine ourselves to just the genes that influence the amount of skin color, a true picture is not seen. In the white-negro crosses, there is produced a hybrid called a mulatto. The mulatto produces off-

Fig. 20.—Three types of anteropostero-occlusal relations; (1) an end-to-end relation, (2) a normal overbite and overjet and (3) a retrusive type in degree.

2. Hoskins, Margaret M.: Effect of Acetyl Thyroxin on White Rats, J. Dent. Res., 8:85 (Feb.) 1928.

spring as a rule that are intermediate in color, but very often we see a mulatto family having a group of children, one of which is lighter in complexion than the others and one of which is darker than the others. This is explained in the genetic composition of the mulatto. There is a tendency for the one to be pure white and the other to be pure black. These variations in color produced in the mulatto family are in proportion to the number of genes that influence this characteristic. There is just one thing that the genes must do, and that is to obey their laws. They are partners in the hybrids and do not mix with each other. If they did mix with each other to form a new race, it would be impossible for the mulattoes, when they interbreed, to have offspring that varied in color. The fact that they do vary in color from light to dark shows that the genes for color are separable. The combinations vary in the same relation as has been shown with plants, except that there are more factors from a genetic standpoint involved in the mulatto. There have been special experiments conducted in which a special apparatus was used to detect the difference in the amount of skin color in the offspring of the mulatto families. Mr. C. B. Davenport, of New York, connected with the Station of Experimental Evolution, has been able to observe with this special apparatus the many genetic differences that appear in the mulatto offspring. (Fig. 17.)

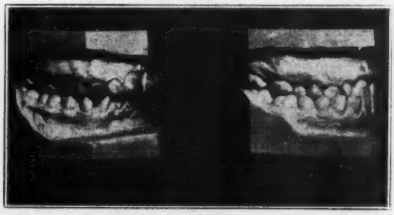

Fig. 21.—Left: Protrusive relation of lower anterior teeth to upper, with bilateral crossbite of posterior teeth, varying in degree only. Right: Retrusive relation of lower anterior teeth to upper, with normal relation in posterior teeth.

It would seem that two races never emerge in their true form after they have crossed. The offspring of mulattoes are never pure negroes nor pure caucasians. They all show evidence of a mixed origin, even though their color may, in some instances, be almost that of the pure race. But bear in mind that skin

Fig. 22.—Skull in which two central incisors vary 1.5 mm. in width. They also show other variations in the character of the teeth. One lateral is impacted and the other lateral is in lingual relation to the anterior teeth. The posterior teeth and lower anterior teeth are apparently in normal relation to each other. The upper left incisor measures 0.488 inch, or approximately 12.5 mm. The upper right central incisor measures 0.443 inch, or approximately 11 mm.; a difference of 1.5 mm. between the two central incisors.

color is not the only trait that is distinctive of the two races. There are differences in the shape of the skulls, character of hair, thickness of lips and numerous other traits that go to make up the various characteristics of the two races.

The individual genes characteristic of each race would still be in existence, but only in combinations that are different from those of the pure race. When there are several genetic differences between two races, the difference in the traits as they appear in the one pure race or the other is not determined by just one type of gene, but by two or more. These are called "multiple factors" of inheritance.

Fig. 23.—Diastema between upper central incisors. The posterior teeth are in normal relation to each other. This would represent a greater osseous development in the maxillary arch as compared to the mandibular arch and the size of the teeth.

Basically, all inheritance conforms to one and the same principle. It is only on superficial inspection that the more complicated cases conform to some other mode of inheritance. From the fact that these matings of the genes are by chance, one can readily see that it is impossible to obtain a pure individual. This explains the ultimate results or the possibility of "multple factors" in inheritance. (Fig. 18.)

The negro-white cross is by no means the most involved case of inheritance that confronts the student of heredity. Breeders have obtained hybrids by crossing animals and plants that belong to different species, and not merely to different races of the same species. The mule is a familiar example of a hybrid species of this type.

Mendel's principle is the basis of all inheritance. The precise details involved in any particular case must be worked out. Mendel made a discovery which is just as fundamental in the world of living things as Newton's laws of mechanics are among inanimate things, and the more complicated cases of inheritance do not direct a damaging finger at this principle. They point to something dependent on this principle, which is explained in the "multiple factors" of inheritance.

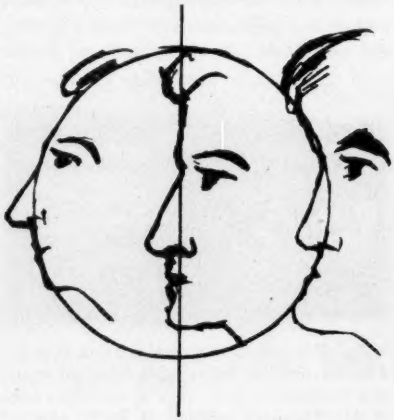

Fig. 24.—Three typal profile forms; (1) convex, (2) straight and (3) concave. These vary in degree only.

Man, to be sure, has many peculiarities as a species, as have other species; but, all forms of life, no matter how simple or complicated, have certain things in common, the fundamental characteristics

of their organization. The biologist sees evidence of this similarity in the microscopic structure of the cells, and when he discovers a principle that applies to one, he often finds that it applies to all others. For example, when it is found that the genes are stable in the plant, as in one of the bean family, it would be logical to expect them to be stable in the human species. It is true that there are no pure lines in man in the same sense that there are in the bean family. Man outbreeds too much for that; but the breeding process, as far as observations have been made, in no way influences the fundamental properties of the genes. It merely results in the different distribution of the genes in the individuals that are hybrids. Whenever an individual is pure as regards the genes that affect a particular trait, the trait is no longer subject to heritable variations. Despite the limitations that there are in selection, breeders have accomplished truly amazing feats. There are cows that produce a half ton of butter fat a year; hens that lay one egg a day; horses that run a half mile in less than a minute or that move heavy loads through sheer bulk. This has been accomplished by selection of genes and grouping them. It seems plausible that the human race is very comparable in this respect, and thus the various characteristics that are present today are accounted for.

The possibilities for improvement of the human race are far-reaching at the present time. When the understanding concerning the laws that govern the developmental factors of the races is more nearly perfect, present conditions may be better solved. Just recently, scientists at the University of California have perfected a machine that will take 250,000 photographs per second. They have used the infrared rays and the ultraviolet rays in photography and have been able to show cells at various depths without destroying them. They have also photo-

Fig. 25.—Models of twins. The irregular alinement and position of each tooth in the corresponding maxillary and mandibular arches are very similar. Indeed, the lower cast of one will fit the maxillary cast of his brother.

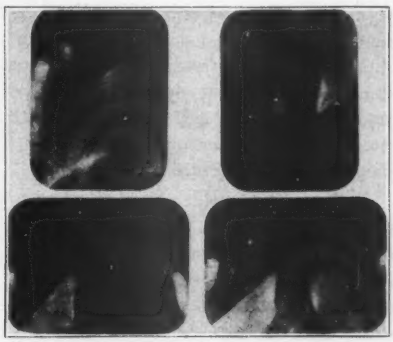

Fig. 26.—Anterior teeth of twins, referred to in Figure 25. The impacted cuspid on the right side of each maxillary arch is in the same relative position to the central and lateral incisors. The left impacted cuspid of one twin is in the same relative position as the right impacted cuspid. The eruption of the left permanent cuspid in one twin may have been due to an injury when this boy was thrown from a horse.

graphed from a distance of hundreds of miles, the photographs giving details. You can see that the advancement of science in certain fields may affect materially the study of heredity, and who knows what the future possibilities may be?

What relation do these biologic factors bear to the osseous and dental structures? Surely, all will agree that a thorough diagnosis or a knowledge of fundamental facts is one of the most important considerations in the dental profession. It seems reasonable that a thorough understanding of the principles of heredity and its genetic form would materially aid in more complete diagnosis in all branches of dentistry. There can be no question regarding the interdependence of biologic factors in their application to dental problems. It is reasonable to assume that deductions can be made from these basic factors that are vital in their application to the problems encountered in a dental practice.

A thorough consideration of heredity and environment in their relations to the osseous and dental structure is essential in diagnosis previous to the study of pathologic conditions. For example, a small tapering maxillary arch opposes a large ovoid mandibular arch, or vice versa. Incidentally, one might mention any number of combinations and their variations, with respect to the development of size and form of the maxillary arch and its relation to the mandibular arch. Any attempt to restore in part or in whole, or change one form to correspond to its opposing form without maintaining harmony between osseous development, arch form, and muscular development will violate all the laws of mechanics, harmonious function and the art of esthetics. Therefore, it is self-evident that a knowledge of the basic factors relative to development, form and function of both osseous and soft tissues is essential in making a diagnosis and prognosis in a case in any branch of dentistry.

In a recent paper by Dr. Kirk, of Philadelphia, entitled "A Study of the Dynamics Involved in the Evolution of the Human Dentures in Relation of Centric Occlusion," this statement was made:

> It is a fundamental law of biology that the existence of all living organisms from microbe to man depends upon the continuous adaptation of the intrinsic vital forces of the organism to the extrinsic forces or stresses that act upon it from without. It is the success of the organism in adapting itself to the conditions of its environment that determines its ability to maintain a continued existence. In the reactions of the intrinsic forces of the organism to the stresses of its environment, there is a constant tendency toward the attainment of an equilibrium or balance in harmonious analogy with Newton's third law of mechanics, that every force is opposed by an equal and opposite force, or that the mutual actions of two bodies are always equal and oppositely directed. The internal forces of the organism, both potential and kinetic, as well as the external stresses of its environment are constantly changing in direction, intensity and time of effective operation, so hat the equilibrium attained at ony one period is an unstable one, with the result that development and growth are constantly undergoing modifications. Structure and function of our organism are directly co-ordinated and their relationships in a dynamic sense are likewise conditioned by the inherent tendency of the forces involved to establish an equilibrium.

From a genetic relation, few, if any, of the true typal forms can be found as regards osseous and dental characteristics. Therefore, the many combinations and degrees of variation as to size, form and harmony in the osseous and dental structures would be compatible with the principles of heredity and environmental influences.

There are various sizes of maxillary and mandibular arches. These are op-

posed by each other in any possible number of combinations. This holds true in both the occlusion and ridge relations. Observations and studies by investigators show that, in the human dentures, there are three typal arch forms; namely, the square, the tapering and the ovid. The possible number of combinations of these three typal forms in both the maxillary and mandibular arches have been discovered, with their degrees of variation and the various combinations in which they may oppose each other. These combinations are evident in both the occlusion and ridge relations. When these basic factors and the variations in degree are considered in regard to occlusal and ridge relations, there are presented eight basic types: (1) a bilateral crossbite; (2) a unilateral crossbite; (3) an end-to-end relation of the cusps, and (4) what is termed normal occlusion (posterior teeth); (5) a protrusive type; (6) a retrusive type; (7) an end-to-end relation, and (8) what may be termed as a normal relation. These are the relations of the anterior teeth. There are found in Nature the same number of combinations that are possible in these various types of occlusion or ridge relation, with degrees of variation. (Figs. 19-21.)

Observations and studies made by M. M. House, of Whittier, Calif., who designated this classification, have proved that the eight basic types of occlusion and ridge relation and their variations in degree will cover any relation that may be presented in the occlusion or in edentulous arches.

This would clearly show that the principles of heredity are definite in law and form. When it is considered that these various forms of development have come from a microscopic cell and that there are such factors as mutations of cells, inbreeding and outbreeding of the human species and multiple conditions of inheritance and environment that have had an influence in the development of the dental arches and their associated parts, it is shown definitely that genetic development and form are the only basis for the various types of arch form, ridge relation and occlusion.

It would be absurd to assume that the various types of food, or the hormones of the various endocrine glands would affect only one arch, either unilaterally or bilaterally, and cause the conditions as they are found in the dental structures.

To think that these conditions just happened or occurred as a result of an extrinsic or environmental influence would be very questionable. When these facts are considered from a biologic and genetic standpoint, together with environmental variations, the subject is changed from a chaotic state to a logical and definite procedure in diagnosis, prognosis and restorative work in all branches of dentistry.

It is interesting to know that, in all of these conditions as they present themselves, and the possible number of influencing conditions, Nature has in every combination and its variation developed a fine degree of harmony. The original intention of Nature would be to have the finest degree of harmony as is expressed in all of her handiwork. If you consider the genetic development and form and carry this idea into the restoration of lost structures or organs, two amazing things will be accomplished: (1) the fine degree of esthetics as Nature presented it in development, will be restored; (2) the mechanical arrangement of the parts to be replaced will be in harmony with mechanical principles and the function of all associated structures of the oral cavity.

There are found extreme degrees in these previously mentioned types. This would constitute an inharmony of development. The only plausible explanation of this is in the genetic variability of the progenitors of the individual.

Observations show that there are three types of outline in the osseous development of the bones of the face and cranium, namely, the square, the tapering and the ovoid, with degrees of variation. There are also any number of combinations of these three typal forms and degrees of variations in them. The combinations and variations of these outline face forms are based upon the hereditary units, the genes, which are the determiners of development and form.

Nature, in her wonderful work of art, shows that a direct proportion of harmony exists between the outline form of the face and outline form of the teeth, in both size and form.

Dr. Berry, of Milwaukee, Wis., was the first man in the dental profession to call attention to the harmonious relation between the outline form of the face and the outline form of the anterior teeth. This work was developed by J. Leon Williams,[3] who found that there was a fundamental principle involved in relation to the outline form of the anterior teeth and the face form.

In his studies and investigations, he found that there is considerable variation in the human teeth, especially in the upper central incisors. On examination of more than 1,000 specimens, marked variations in form were found in all races, and apparently there were only vague indications of racial peculiarities. From his deductions, it was found that there are the three distinct typal forms.

3. William, J. L.: Relation of Teeth of Man to Anthropoid Apes, J. Dent. Res. 8:289 (April) 1928.

There have been observations and studies made by other investigators corroborating the fundamental principles of osseous and tooth outline form and the harmonious relation that exists between them.[4]

It was found that the square type represents a minority in number, but the more severe typal form of the human central incisors. The great majority are the various blendings of the typal forms. It was his deduction that all of the teeth in an arch partook more or less of the typal characteristics of the upper central incisors. The greatest variations occur in the upper lateral incisors and the third molars. A final analysis showed that the racial types of teeth, as previously conceived, is nonexistent. Instead, it would be thought that there are three typal forms in all races with what might be termed minor racial variations or characteristics. It was observed that the savage races presented more refined typal forms of teeth than the civilized races. Studies of other investigators confirm this observation.

In his study of the anthropoid apes, Dr. Williams found three typal forms of anterior teeth, namely, the square, the tapering and the ovoid. These types were present in the gorilla, the orang-utang and the chimpanzee. The typal forms in these three great anthropoid apes were more strikingly and clearly differentiated than they are in the human race. This proves that the typal forms of the teeth are strictly true to a developmental character and are not a racial characteristic.

The extensive observations and studies of skulls and teeth, in museums, colleges, orphanages and private collections,

4. House, M. M.: Outline of Examination and Classification of Mouth Conditions, Domin. Dent. J., 33:98-100 (March 15) 1921.

made by M. M. House, show that there are three typal forms of anterior teeth: the ovoid, the square and the tapering, with degrees of variation. It has also been observed that there are various combinations of these three typal forms, and degrees of variation in these combinations. His studies would in every respect confirm the fundamental principles presented by previous investigators. Drs. House and Loop are conducting a study at present on tooth form and face form as regards the relation of size, form and development to each other. In all probability, when this study has been completed the work will show a definite relation between osseous form and tooth form, establishing the fact that they are in direct ratio to each other. Observations show that, esthetically, the posterior teeth also have typal forms. It has been observed that the outline forms of the posterior teeth and anterior teeth share the same degree of harmony with respect to the arch forms and face forms, together with intercuspal relations comparable to the four classes of occlusion.

It has been found from studies of large collections of extracted teeth, skulls with natural teeth and many living subjects, that there are no two central incisors alike in any arch (identical twins being excepted). There have been variations observed as great as 1.5 mm. in the width of the central incisors in the same arch. There are also other comparisons of the two central incisors in the same arch that show characteristics varying in degree. (Fig. 22.)

It is true that there are inharmonies in the relation of face form and tooth form, which is a natural sequence of genetic variability and the extensive hybridity among the human species. Nature, in her work in the greater majority of all cases, presents a fine degree of harmony between the tooth form and face form, both esthetically and functionally. There are cases of diasthema, especially between the central incisors. These conditions appearing in the extreme degree would constitute an inharmonious relation of development between the osseous and the tooth structures. (Fig. 23.)

Nature, in her constancy of form, has so arranged the forms of the teeth that dental anatomists describe each tooth and present definite points of anatomic relation that each may be segregated from any of the others. This would give definite proof of the genetic form of the teeth together with the constant developmental power of the human species, having its source in the genes.

It has been found through observation and study that there are three typal forms in profile outline; namely, the convex, the straight and the concave, with combinations of these three typal forms showing degrees of variation. These may vary in combination in different thirds of the face. There is a direct proportion of harmony between the profile typal forms and combinations and the labiogingivo-incisal form of the anterior teeth. This harmony of tooth form to profile form presents a vital factor in restoring lost dental structures, in part or in full, so that the same harmony is maintained in the artificial restorations as was manifested in Nature's work. (Fig. 24.)

When we consider the gross mass of people, is it not marvelous to find the harmony that has developed in the human species relative to the osseous form, tooth form, muscle form and the corresponding structures associated with them? All studies and observations show that Nature in her plan has intended the greatest degree of harmony to exist in all of the organs of the body. The va-

rious degrees of modification of these, and the various combinations with their varying degrees, together with the inharmonies and anomalies, are the result of the definite laws of Nature, in the genetic forms of development.

The same law that maintains the greatest harmony in form and development also has given the degrees of variation and combinations. It has been said that in every pair of human cells there are 16,777,216 combinations of physical, mental and temperamental characteristics. From this number of combinations, it would seem that Nature has truly accomplished a marvelous work. The fact that the human species has crossed in almost every possible combination and that the process of outbreeding is greater as the mode of travel is increased would explain the various combinations of types and their degree of variations. It would be logical to expect a greater number of combinations in the future, because the human race is rapidly becoming more cosmopolitan.

Observations that the savage tribes or races have a more stable and more refined form than those found in the civilized races would afford another proof of the genetic relationship of tooth form and osseous form. It is known that the savage races do not outbreed to the extent that the civilized races do. They are naturally confined to a smaller area and they interbreed among their own tribe to a great extent, which would more naturally bring to light the true character and form of their teeth and associated parts than if they had crossed outside their tribe. In every respect, the savage race would be purer in type because their inbreeding would produce the pure or nearly pure types and decrease the number of hybrids.

The Indian skulls from Peru, and the Channel Islands of the Pacific Coast, New Mexico, and other parts of the United States, that have been observed and studied at the San Diego Museum,[5] show that there was possibly a greater harmony between the osseous form and tooth form than there is to be found among the present civilized races. The reason for this, no doubt, is that the inbreeding of these tribes and the origin of these people would naturally make their genetic composition and character more of the pure typal forms than the combinations found in the present civilized races, which are hybrid to a marked degree.

This genetic relation of tooth form is exemplified in the studies of the anthropoid apes. If all species of animals and plants carry a definite relation to their hereditary characters, it would be logical that, in the species of apes mentioned, the typical forms of teeth would be more refined and stable and truer to a pure typal form, because they inbreed far more than they outbreed.

There is no question that Mendel presented the principle by which we can explain these various conditions as they are encountered at present. In short, it may be said that the principles of mendelian inheritance with environmental influences are the basic factors that control the typal tooth forms, their combinations and variations; the typal arch forms, their combinations and sizes, and face forms and their combinations, together with the soft tissue forms and harmony of the esthetic art and function of all associated structures or organs.

The most definite example of the

5. Moodie, R. L.: Studies in Palendontology, Pacific Dent. Gaz., 36:201 (April), 259 (May), 414 (July), 455 (Aug.), 525 (Sept.), 669 (Nov.), 757 (Dec.), 1928.

genetic development of harmony and constancy of form is found in the studies of identical twins. The fact that they developed from the same fertilized ovum and that the environment is as nearly uniform for both of them as is possible would give a knowledge of the laws of genetic powers as regards form, harmony and development of the osseous and soft tissue structures of the oral cavity and associated structures.

There is one example that has been cited of identical twins that were born near London. They were separated at about 2 years of age, one living in London and the other in Canada. When these two girls met each other after approximately eighteen years of separation, they were studied by a biologist. In his deductions and comparisons from a physical standpoint, he found that the right side and the left side of each one of these twins were practically identical, but that one side differed from the other side of the same individual. It was also found that the tooth forms and harmony of development in relation to the osseous forms and harmony was comparable to that of the physical form as regards unilateral development, that is, that the right half of the arch of one was very similar to the right half of the arch of the other and the left half of the arch of one to the left half of the arch of the other. The right central incisor of one twin appeared to be a duplicate of the right central incisor of the other twin, and vice versa. The two central incisors in each arch varied to a considerable degree, but the hair, eyes, skin, etc., were alike. It would seem, from these deductions, that the environmental conditions under which they lived had little to do with their forms of development as regards form, size and harmony. It also shows that neither the acquired characteristics of these sisters nor their environment would seem to have an influence over development to any great extent. It proves beyond a doubt that the genes which influence any particular organ or part of the body are governed by fundamental laws, and that, all other things being equal, they will develop according to their intended character or form.

There is a study being made at the University of California, of identical and fraternal twins. This work is not available at the present time, but no doubt when completed it will afford many data pertaining to genetic composition and its relation to form, size and harmony.

Dr. Woodbury, of Council Bluffs, Iowa, has shown casts of twins that were interchangeable with each other.

Observations and studies of identical twins in Los Angeles show the development of pairs to be very much alike, and confirm the conclusions of other investigators. Roentgenograms of the pairs show a close harmony, there being slight degrees of difference that could be related to environment. In one pair that are 16 years old, both have deciduous cuspids remaining on the right side, with an unerupted permanent cuspid having the same relative position in each arch. One twin has the left deciduous cuspid and unerupted left permanent cuspid, the other twin has erupted the left permanent cuspid. The arrangement of the anterior and posterior teeth are nearly in duplicate. They both have a slightly retrusive type of occlusion. It would be difficult to segregate the models and to arrange the roentgenograms for the two not knowing the relation of them. In other physical characteristics, they are equally symmetrical in unilateral development, but are asymmetrical as regards bilateral development. (Figs. 25-26.)

The study of identical twins as regards origin, growth and genetic development shows definitely the relation of the basic fundamental principles of heredity. The fact that the embryo ordinarily develops the right half from one cell at clevage and the left half from the other cell gives the asymmetrical form of the organism. This shows beyond question that each person (except in the case of identical twins) has a form characteristic to no other. It shows definitely that the condyles and glenoid fossa are asymmetrical in form. Thus, the movement of angulation would be different on each side, a fact which has been demonstrated for thirty-five years. It would show that the organism of one person is not like that of any others. In brief, development comes from the fertilized ovum, a microscopic cell; and the cell contains the potential powers of growth and development, as well as the determination of form and structure. Would not this show evidence of the definite relation of the biologic factors of heredity and environment as regards size, form and harmony of the osseous and dental structures?

CONCLUSIONS

In the selection of teeth for restoration of the dental arches, it is essential to consider the typal face forms, their combinations and variations; typal profile forms, their combinations and variations; the size of the arches, their combinations and degrees of variation, and typal arch forms, their combinations and variations, in order to obtain the pleasing harmony that Nature had developed and the greatest degree of esthetic arrangement.

It is essential to consider the eight basic types of occlusion in partial or complete restorations, that harmony may be maintained as the mechanical factors of stress and leverage involved are utilized, to the greatest degree, and that the arrangement of the teeth can be basically and fundamentally positioned harmoniously with function of the jaws and associated structures.

The teeth that Nature has so ably placed in their relations to perform the requirements of esthetic art and mastication cannot be deviated from and still maintain the esthetic and functional harmony that they are intended for.

Considering the asymmetry of development, it is necessary to ascertain the angles of movement of the mandible in both the anteroposterior planes and the horizontal planes, and these movements are to be segregated and directly coordinated with developments of the osseous form and muscular form, if the completed sequence of restorations in all branches of dentistry in part or in whole are to be syncronized with functional movements of the mandible in harmony with the required mechanical factors and esthetics.

The lack of consideration of any basic fundamental biologic factor in the sequence of construction of artificial restorations reduces the functional, mechanical and esthetic efficiency in direct proportion. Analogous to this statement is the old axiom, "A chain is no stronger than its weakest link."

RELATION OF THE NARROW PALATAL ARCH TO NASAL AND SINUS DISEASE*

By HARRY L. BAUM, M.D., Denver, Colo.

I BELIEVE it has been generally accepted by many workers in the field of orthodontia that the high, narrow, palatal arch results in deviation of the septum and a narrow nasal chamber and thus causes nasal disease, with frequent subsequent involvement of the accessory sinuses.

It is doubtless safe to admit that narrow nasal chambers and deviated septums can and do cause nasal and sinus disease, and since they interfere with normal aeration and drainage of the accessory sinuses and favor the retention of products of the activity of pathologic microorganisms after infection, it is entirely logical to assume that they predispose to chronic disease of the nose and sinuses.

Since we admit the possibility that these conditions of narrowness of the nasal chambers and deviation of the septum cause nasal and sinus disease, the question is whether deflection of the septum is caused by the high palatal arch and whether the narrow nasal floor results from the narrowing of that arch.

This question cannot be positively answered and that answer be absolutely proved. It must remain a question of opinion, and our opinions can be but the result of our experience and individual judgment. You will therefore pardon an expression of opinion from the standpoint of rhinology rather than from that of orthodontia. My statements are only expressions of opinion, many in the present state of our knowledge not yet even possible of proof.

It is simple mechanistic reasoning to assume that the high arched palate, encroaching on the septum from below, with the unyielding base of the skull above, limits the development of the septum and causes it to bend and assume an abnormal position of curve or angulation. It is also simple reasoning to assume that the narrow palate communicates its narrowness to the floor of the nose, which lies directly above it, and thus the groundwork is laid for the troubles which are to follow in its train. But a careful review of the facts leads me to question whether this is necessarily true.

We must first go back to the question of genetics, to determine if possible how these structures develop. Schaeffer, in an admirable paper[1] on the subject of the genesis and development of the human palate, says: "The germs of the teeth, the maxillary sinus, the thickness of the alveolus, etc., will be found to be in accord with the age of the infant, that is, the parts develop *para passu*. In other words, one part does not force the other to be

*Read before the Section on Orthodontia at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 24, 1930.

1. Schaeffer, J. P.: Some Problems in Genesis and Development with Special Reference to Human Palate. Internat. J. Orthodon., 15:291 (April) 1929.

what it is, but needs its relationship for a balanced growth."

I have myself observed a number of skulls and many more cases clinically, and I have been impressed by the fact that the high narrow palatal arch does not necessarily mean a narrow nasal floor or a deviated septum. On the other hand, the broad flat arch frequently is accompanied by a deviation of the septum or a narrow nasal floor. Cryer[2] has shown this most conclusively by careful anatomic studies and Schaeffer concurs in the opinion in quite definite terms,[1] proving further the belief[3] that the width of the nasal floor is determined by the development of the antrums and not by the width of the palatal arch.

This is well illustrated by a case coming under my own observation. The patient had an imperforate posterior choana on the left side, the right being normal. Examination of the nose revealed the fact that, on the right or open side, the nasal floor was very wide and extended much lower laterally than normal, with a correspondingly small antrum. On the left or imperforate side, visual examination of the nasal chamber revealed nothing abnormal. The palatal arch was very high to the left of the center, going upward posteriorly in a sharp V to fuse with the bony plate which occluded the posterior choana on that side. The width of the arch was normal. I took the wide nasal floor on the right to be a developmental anomaly and decided that it was not due to overuse of that side, as one might think, for there was no abnormality in the width of the air space in the nasal chamber, the turbinates having grown large enough to compensate for the additional room. The condition was clearly demonstrated by filling the antrums with a contrast medium and mak-

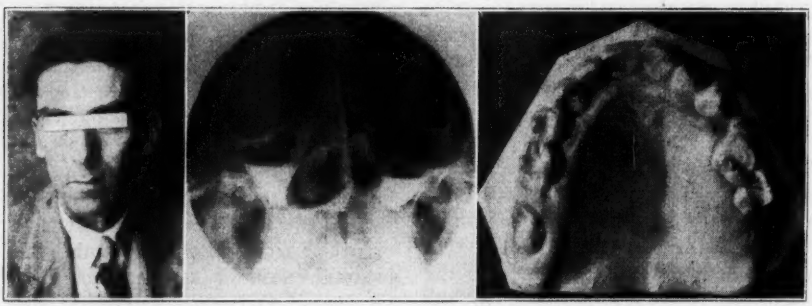

Fig. 1.—Left: Appearance of patient; showing normal development of maxilla. Center: Extremely wide nasal floor on right or open side with small antrum on that side. Palatal union seems to have taken place to the left of the midline, to judge by the incisor teeth. The left or obstructed nostril is practically normal in size and the antrum on that side is well pneumatized. The antrums contain equal amounts of a contrast medium. Right: Cast of palatal arch, showing normal width. The pencil line to the left of the center indicates the line of union of the two halves of the palate. This seems to run upward and backward to the left to join the mass of bone filling the posterior choana on that side.

2. Cryer, M. H.: Internal Anatomy of Face, Philadelphia: Lea and Febiger, 1916, p. 94.

3. Schaeffer, J. P.: Nose and Olfactory Organ, Philadelphia: P. Blakiston & Son Co., 1920, pp. 75-76.

ing roentgenograms. (Fig. 1.) This case, I believe, proves that the width of the nasal floor is in no way dependent on the width of the palate, but is entirely predicated on the development of the antrums. The case is particularly striking because it occurred unilaterally in a patient showing a different developmental anomaly on the other side. I have never seen another such case of extensive unilateral widening of the nasal floor.

The most important developmental factor in the consideration of septal deviations is probably the eruption of the incisor teeth, with inequality in the descent of the two halves of the palate. Mosher[4] says that when the eruption of one central incisor is delayed, it causes a deformity or hypertrophy of the premaxillary wing above it. This results in septal distortion, with a resultant convexity to the opposite side.

This is the basis for the statement that, in my belief, narrowness of the palatal arch does not cause deviation of the septum or narrowness of the nasal floor. Therefore, widening of the arch does not correct or prevent septal deviation, nor does it give additional room in the nose. This may sound like heresy to many orthodontists, but it is what my observations have led me to believe. I realize that the opposite theory has had many exponents and that the reasoning behind it seems quite convincing, but we are

Fig. 2.—Left: Appearance of patient; showing normal facial and maxillary development. The scar of a laryngostomy is plainly seen. This closure was accomplished within the past year. Up to that time, the patient breathed through a tracheal cannula without apparent effect on the maxillary development. Right: Normal development of nasal passages and antrum.

4. Mosher, H. P.: Influence of Premaxillae on Form of Hard Palate and on Septum, Items Int. 31:481-515 (July) 1909.

sometimes too easily convinced by the obvious in reasoning, without going deeply enough into the many angles of investigation which the question offers. You will doubtless tell me of results that you have observed which tend to prove me wrong, but we should not too easily attribute apparent results to the thing that is most obvious. We must realize that children are growing and developing while they are being treated and that possibly normal nasal breathing has been established by other means than the treatment. In other words, results which follow a certain system of therapeutics do not necessarily prove the efficacy of the system. Therapeutic results only tend toward proof. Also, it is only proper to add that the only way in which real widening of narrowed nasal passages could take place would be by a moving outward of the lateral wall of the nose. A glance at the dried skull will show that this would be possible only if the widening actually split or stretched the palate and spread the entire maxilla; which I do not believe it does. It is my opinion that the widening operation has its entire effect on the alveolus, but I expect many of you to disagree with this opinion.

I do believe that delayed eruption of the incisor teeth may cause deviation of the septum and that narrow nasal floors sometimes accompany narrow palatal arches. The latter I attribute to operation of the same causes underlying both conditions in the development of the nose and the upper jaw. These causes may be embryologic, hereditary or environmental.

If they are hereditary, we have no control over them in the present state of eugenics. If they are embryologic, we must study them from the point of view of rudimentary and developmental potentials. Over these, we can have no control as yet.

If they are environmental, they may be due to one or more of several causes: Improper habits of infancy or childhood may frequently cause serious developmental anomalies, as you well know. Nutritional influences are important, and if we could see the patients early enough, we might do something constructive; but progress must come largely from education of the race in general. Traumatic effects are easily and frequently observed, and the relation of cause and effect in these cases is usually obvious. Improper dental care in the young is another factor which may be classed as environmental. Without the deciduous teeth to balance development of the jaws and permanent teeth, we may well have the abnormal conditions with which you all contend.

On the other hand, it is freely claimed that disturbed conditions of respiration have a great deal to do with developmental deformities of the jaws. This subject is the reverse of the one actually under consideration, but it is worthy of some thought in spite of that fact because of their close interrelation. Of the obstructive conditions, the most common and the greatest offender is supposed to be the presence of adenoids. If adenoids are a factor, tonsils may also be, for their mere bulk may cause them to be pushed backward and upward by the base of the tongue, with quite effectual closure of the postnasal aperture, either with or without the aid of the adenoid mass. Also, a narrow nose or a deflected system may operate as well to increase the already present tendency to obstruction. It is interesting to note that cases of posterior choanal obstruction, such as the one mentioned above, and many others to be found in the literature similar to the two of bilateral closure reported by Wright,[5] in

5. Wright, A. J. M.: J. Laryngol. & Otol., 37:556-559 (Nov.) 1922.

which the choanae have never been patulous and the patient has never been able to breathe through the nose, do not necessarily have the type of arch and nasal passages referred to. In fact, the development of the nasal chambers in these cases is usually normal and apparently unaffected by entire loss of nasal function.

So also are the noses of children with complete atresia of the larynx, breathing entirely through a tracheotomy tube as they must. Still, as has been shown by Turner,[6] their noses and palates develop normally. I, with most laryngologists, have had a number of such cases under observation at one time or another, one of which will suffice for illustration. This child suffered from complete atresia of the larynx, which required the wearing of a tube through which he breathed entirely during the age of most active development. Figure 2 shows the width of the nasal passages and the condition of the septum, as well as the appearance of the patient.

Observations such as these tend to lessen the value of the theory that disuse of a part causes developmental anomalies. In fact, I think they invalidate it, and lead us more deeply into a state of doubt regarding the true causes of the conditions under consideration. These cases are illustrative of the results, or lack of them, which may accrue from complete disuse. They do not take into consideration the possible result of partial interference with function, such as takes place with the ordinary forms of obstruction mentioned above and with which we are most familiar. What of the theory that partial obstruction is operative in producing these anomalies, though complete obstruction is not? In brief, this theory assumes that partial obstruction results in negative pressure in the nose with resultant pushing in of its walls by atmospheric pressure from without. Collier[7] mentions in this connection anterior obstruction from injury or collapsed alae. It is conceivable that anterior obstruction might result in an increased intranasal vacuum on inspiration, with some such result as outlined, but such forms of obstruction are extremely rare in the experience of most of us, I am sure. The cases most frequently brought to our attention are those with postnasal obstruction in which the result could not be that of increased intranasal vacuum or inspiration, but should, if the theory is correct, be entirely unaffected or possibly affected in even the opposite direction because of the production of even less than normal negative pressure on inspiration. Also, we should not lose sight of the fact that the rhinologist sees many cases of nasopharyngeal obstruction of varying degree in which there is no deformity of the jaws or nasal passages and, at the other extreme, many in which the early removal of obstructive adenoids has had no effect on the progress of the abnormal development of the maxilla. If the obstruction were really a cause, its removal should arrest the further progress of abnormal development, but this it does not do.

On the whole, therefore, and taking all factors into consideration, I am more inclined to think that the conditions mentioned above of obstructed nasopharynx, narrow nose, narrow and high palatal arch, deflected septum and secondary nasal and sinus disease are simply associated conditions resulting from the same

6. Turner, J. G.: Relation of Nasal Obstruction to Dental Disease, referred to by Wright (Footnote 5).

7. Collier, Mayo: Clinical Lecture on Deformities of Face and Upper and Lower Jaws Due to Nasal Obstruction, M. Press, 143:518-522, 1911.

primary developmental anomalies and operating together to accomplish the undesirable results which we meet in practice.

It may be asked why, if narrow palates does not cause narrowing of the nose, widening operations so often result in good breathing when the removal of obstructive adenoids does not. My answer has already been partially indicated above, for further development of the bones of the face may be a factor, but that is certainly not all. Other important factors should also be taken into consideration. It is a well-known fact that negative pressure and not muscular contraction is utilized in keeping the jaws in apposition when at rest. It is possible that poor occlusion or a very narrow high bony palate may interfere with the comfortable production and maintenance of this negative pressure. Such also may be the effect of a too short or tense soft palate, especially the type which is seen after tonsillectomy in certain instances. Thus, the very procedure which has been invoked for the purpose of giving additional space may defeat its object. In other cases, there may be a dropping back of the tongue into the pharynx on account of insufficient room in the narrow arch, according to a theory of Cryer,[8] which seems logical to me. This posterior displacement of the tongue would quite effectively prevent nasal breathing, as normally, when at rest, the tongue and palate are but a short distance from the posterior pharyngeal wall.

I have studied a number of these cases carefully and have seen some in which, in spite of widening of the arch, there was still mouth breathing, although all obstructions were apparently removed. In some of these I have been unable to account for the persistent mouth breathing except on the grounds of habit.

8. Cryer, M. H.: Disc. of Stout, G. C.: Borderline Between Dentistry and Laryngology, Dent. Cosmos, 53:106-109 (Jan.) 1911.

CONCLUSIONS

1. Narrow nasal floors and deflected septums do not result from narrow palatal arches.

2. Widening of the arch does not straighten the septum or widen the nasal floor.

3. Delayed eruption of one incisor tooth causes premaxillary irregularity and septal deviation.

4. Obstructed nasopharynx, the narrow palatal arch, narrow nasal chambers, deviated septums and resultant nasal and sinus disease seem to be associated in many patients coming to the orthodontist for corrective work.

5. The fundamental conditions just enumerated are probably interrelated and dependent largely on genetic and developmental potentials which can and do profoundly affect the eventual form of the several parts. The secondary nasal and sinus disease is a logical sequel to the primary abnormalities, once they are established.

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DISCUSSION

A. H. Ketcham, Denver, Colo.: The presence of protruding maxillary anterior teeth and posteriorly placed mandibular teeth, with a short upper lip and a thick, overly developed lower lip, makes it difficult for the patient to breathe normally, even though the nasal space is nearly normal. It is the common observation of orthodontists that correction of malocclusion of the teeth, along with lip exercises to correct abnormal lip function, will enable the patient to overcome the mouth breathing. As regards the possibility of benefit from orthodontic treatment to those patients who have a narrow nasal space and also a narrow maxillary arch, I can say from clinical experience that, in such cases, the de-

velopment of the maxillary dental arch to normal size through orthodontic treatment often has a decidedly beneficial influence on the development of the nasal space. The transactions of the American Laryngological, Rhinological and Otological Society for 1912 contain a report of the case of a 14-year-old boy who had a very narrow maxillary dental arch (pp. 301-314). The rhinologist, T. E. Carmody, of Denver, reported that, on examination, he found the nasal space of about one-half normal capacity, not only on account of narrowing, but also on account of an intumescent condition of the tissues. The septum was deflected to the right. Maxillary and mandibular dental arches were developed through orthodontic treatment to normal size and form and the teeth placed in occlusion. Three and one-half years after the first examination, Dr. Carmody reported the nasal space apparently normal, septum straight and turbinates normal. What influence infected maxillary sinuses have on the development of nasal space; whether lack of development of a normal nasal space has an influence on the development of the breadth of the maxillary dental arch, or, conversely, a narrow maxillary dental arch has a retarding influence on the development of the breathing space are questions which have not been decided. It is possible to correlate the studies of the development of the maxillary sinuses, the nose cavity and the maxillary dental arch, so that we may learn whether the development of the nose cavity and maxillary dental arch are interdependent. It is quite likely that the research which is being carried on at the Child Research Council which W. W. Wasson founded at the University of Colorado, where for ten years they have been examining children by the roentgen rays at frequent intervals from birth until, in some cases, 10 years of age, may throw some light on this question. They now have about 100 children under this regular roentgenographic checking up, and as one of their standard positions is an anterior-posterior view of the head and sinuses, including the nose cavity and maxillary dental arch, they are accumulating valuable data. Similar research is being carried on at the Western Reserve University, Cleveland, Ohio, by T. Wingate Todd and B. Holly Broadbent. In this case, they are including not only anterior-posterior and profile head roentgenograms, but also photographs of the head and face and impressions of the teeth and jaws, all taken with standardized positions and angles. I have observed in the mouths of a few of our orthodontic patients a condition similar to that shown in the roentgenograms which Dr. Baum has passed around, also in the models of the maxillary arch showing one side of the palate higher than the other. I believe that in these cases, and also in those cases in which we have interference with breathing, we should have anterior-posterior roentgenograms showing the maxillary sinuses, the nose cavity and the maxillary dental arch before orthodontic treatment is undertaken.

Edward M. Griffin, New York City: There is one phase of this question that may be included here; that is, teaching children as to proper breathing. The orthodontist can do some very valuable work in this respect, and I believe that proper function will be conducive to proper development. Not only have we taken this stand in our office, but the New York University also has taken this stand, giving scientific instruction in proper breathing.

Henry F. Hoffman, Denver, Colo.: We have all taken too much for granted in our estimate of cause and effect, and the relation of the narrow maxillary arch to sinus disease. It has always seemed to be quite a question of whether the widening of the arch really affected the size of the nasal fossa. I have seen little to indicate that such is the case, but as we know so little about it, none of us are in a position to say just what the facts may be. It is a subject which should form the basis for research work. Possession of more facts would enable us to diagnose and treat cases more successfully.

Abram Hoffman, Chicago, Ill.: In an institution with which I am familiar, a graduate student in orthodontia is undertaking the study of the shape and size of the upper arch as a topic for a thesis, and, in this graduate school, there is also under development a nose and throat department. A correlation is being made. These arches are being studied and impressions and models are being made of about 500 skulls. Later, these skulls are to be sectioned, and a graduate student from the medical school is then to carry on a study of the measurements of the nasal chambers as compared to the measurements of the upper dental arch, with the hope that we may arrive at something of value and a correlation of the shape, size, etc., of

the nasal chambers and dental tissues. It may help us in some of these problems.

W. Walter Wasson, Denver, Colo.: If I draw a sketch of the skull, we have the orbits with the nasal septum halfway between them, ethmoid cells between each orbit and the septum, an antrum below each orbit, the floor of the nasal cavity below the floor of the antrum, which lies very high, and the infra-orbital canal above the antrum. The ethmoids are very small, the frontals are undeveloped and the antrums are about the size of a split pea. That is the situation soon after birth. Later, the antrums grow downward and outward, while the nasal spaces enlarge. We measured roentgenograms of infants' skulls, which were made periodically every three months from the time of birth, and we found there was enlargement of the transverse diameter of the entire head as well as that between the orbits and the one between the antrums. It is evident that all bones of the face grow uniformly and with a certain relation to each other. No doubt, that is due to the influence of hereditary and racial tendencies. Then, too, there are certain variations to meet the requirements of environmental conditions. As I see it, the problem for the orthodontist is how he may influence those variations to more nearly approach the ideal. At first thought, it would seem that if the arch of the hard palate is broadened, its curvature would be flattened downward and outward. But let us suppose that, at the same time, the bones themselves grow upward in response to the stimulation from the orthodontic appliance. It might be possible that the arch would remain high instead of flattening. Here, again, there is no question that the bones of the face grow in all directions. Dr. Ketcham and I have often discussed the problem as to how we can go back to those roentgenograms of the growing infant and find some one fixed point. And we always return to the same fact, that the bones grow in all directions. If the orthodontist can contrive, by his appliance, to stimulate the arch to grow faster than the rest of the bones of the face do normally, he may alter the shape of the face. The other problem which might influence sinus infection is not dependent on raising the floor of the antrum to produce better drainage. The floor of the antrum does not lie below the floor of the nose until some time after 8 or 10 years of age. But it is significant that we find considerable infection of the antrum even when it is the size of a split-pea and very high above the floor of the nose. It is also significant that there is a great, perhaps even a greater, number of children under 2 years of age with infection of the sinuses, even though at that age the antrum is very small and lies high above the floor of the nose. I repeat that it is not a problem of raising the floor of the antrum to produce better drainage. From my observations, I believe that the greatest value is to be obtained from broadening the nasal spaces to afford better aeration. Dr. Baum spoke of removal of the adenoids. I find that that procedure improves sinus conditions, but does not necessarily correct them. It probably operates, as I believe most nose and throat men agree, for better aeration of the sinuses. That should be our main purpose. The sinus problem is a complex, poorly understood one which none of us seem able to meet. The question is not one of treating an infected sinus at 15 or 40 years of age, but one of finding that infection very early, say at 6 months or 2 years of age, and by proper therapeutic measures bringing the child to adult life with healthy sinuses. It seems to me that the orthodontists should begin a study of this problem with children younger than 10 or 15 years of age, the age at which they usually seek the advice of the orthodontist. In order to lay down fundamental knowledge, we must begin much earlier. The orthodontist should be encouraged to go ahead, and it will be worth while if he can broaden the face and produce better aeration. My association with orthodontists has been most valuable to me, and I feel that we have only just begun to study this problem.

Dr. Baum: That we are "guessing" in an effort to arrive at certain conclusions in connection with results of orthodontic treatment is the impression that I have received from my own studies, and I am glad to have that impression confirmed by many statements made here. I feel that in conducting research along these lines, a distinct step in advance is being taken. Orthodontists as a class assume too much. They have made claims that they could not back up scientifically. The conclusions that may be drawn from certain changes that take place during the course of treatment should be carefully considered, because it is extremely easy to be misled, especially when one is influenced by the knowledge that a certain procedure is being carried on. Meas-

urements to arrive at the facts as to just what changes are taking place are very difficult to get on the living. Measurements of the dead are of little value, because we are not following the case through. The only case in which we can draw conclusions of value is that in which we have the patient under treatment and make measurements from all sides to determine what is happening from time to time. The best means available is that of the roentgen rays, as Dr. Wasson has explained. Measurements of the width of the nasal chamber in the living are likely to be very inaccurate. There are great variations which may take place in a space of less than five minutes in the mucous membranes. The membranes swell and shrink with the slightest change in atmospheric conditions, for example, as well as in other conditions too numerous to mention. So that it is extremely difficult to arrive at conclusions which we can feel are accurate, and which are really scientific. One point that was brought out by Dr. Wasson's remarks was the fact that we know so little about the actual process of growth, and yet it is growth and development that we are dealing with in orthodontic work. We are attempting to influence the growth of bone, about which we know little. But we do know that as to the lateral walls of the nose, normal growth and development expands them, that is, the nasal chambers widen with normal growth, as Dr. Wasson has told you. We know that there is no given, fixed central point from which growth extends. Everything is moving during the process of growth, and we cannot define the central points from which growth radiates. There is a gradual laying down of additional tissue, with the process of growth going on from the time the child is conceived, and with that in mind it is extremely difficult to draw final conclusions when studying such a problem as this. Finally, I want to say frankly to you, that I am not in the least attempting to say the last word on this problem. I have merely made a few observations in the hope of stimulating others to further study.

FACTORS IN THE SURGICAL REMOVAL OF TEETH*

By WILTON W. COGSWELL, D.D.S., F.A.C.D., Colorado Springs, Colo.

CLOSE observation of facts pertaining to surgery of the teeth and their investing tissues has shown the importance of recognizing the influence that variations in the normal anatomic form may have. While, from an anatomic point of view, the teeth and their investing tissues may be perfectly normal, a vast difference is readily seen in the influence these variations may have on tooth removal. Recognition of the variable factors in bone investing the teeth and also their influence on the overlying soft tissues has not been sufficiently stressed. We find that the anatomic form of the investing bone and its relationship to the tooth roots make for retention, and that there is rarely any actual attachment between the investing bone and the tooth substance other than the periodontal membrane. A close analysis of this relationship then becomes necessary before a solution of the problem of tooth removal can be found.

Were there but one type of dentition and investing substance as regards both form and relationship, a standard operative technic would suffice; but we find the contrary true. A continued close analysis of all cases coming under our

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care will disclose a marked difference in the difficulties encountered in tooth removal, according to facial types of patients, and independent of the size of teeth or jaws. It is possible, after considerable observation of cases and recognition of the outstanding indications of these variations, to judge with a fair degree of accuracy the more difficult cases before actual oral examination has been made. While we may find, on oral examination, conditions which may mitigate the difficulties in certain types, it is well to recognize these indications from the first moment of contact with the patient.

Acceptance of the newer methods of tooth removal by surgery of the investing tissues requires a careful study of these anatomic variations, and this study will also disclose the reasons for many failures under the old pressure methods of tooth extraction. It is manifestly impossible to consider in a short discussion the surgical procedure necessary for the removal of teeth under the different types, but attention is called to the outstanding variations in the anatomic structures.

Just as we see that differences in facial type have a direct bearing on tooth form in relation to the crown, we also find, on closer analysis, that these typal variations extend to the roots of the teeth and their investing tissues. We find the classification of teeth as square, ovoid and tapering important in its bearing on tooth removal. The square and tapering types are those which we may utilize in this study. The oval type may include the features of both the others, and may be said to be average.

The square type is found in the person whose general facial contour is compact, with low molar bones, a short upper lip, a square chin and a general appearance of solidity. In this type, we are apt to find a marked lowering of the palate, low and heavy dental ridges and short tooth crowns. Generally associated with this type are thick and less elastic cheeks with a distinct difficulty of retraction due to muscular tension of both the orbicularis oris and the buccinator muscles. The mucoperiosteal fold between the dental ridges and the cheeks and lips is usually attached closer to the gingival crest, overlying a much thicker and heavier mass of investing alveolar process. It will be obvious to those experienced in the removal of teeth that, with this anatomic arrangement, there is more likelihood of difficulty arising from inaccessibility and tooth dislodgment.

In the tapering type, we see a higher relationship of the malar process to the occlusal line of the teeth, a more pronounced dental ridge, a higher palate and the attachment of the mucoperiosteal fold of lips and cheeks much farther from the gingival crest. The mass of investing bone tissue is decidedly less thick, and that of the alveolar walls, forming the sockets of the teeth, is much higher than in the square type. The cheeks and lips are usually thinner, and retraction for accessibility to the operative fields is more easily accomplished.

When the removal of the teeth was dependent on the application of force alone, fracture of the teeth was common, and the difficulty of root removal greatly increased. As lateral or labial pressure for the tooth's removal was always indicated, because of the heavier and thicker mass of the lingual process and the form of the tooth, this was and must still be the indicated direction of movement. But success is dependent on the particular type and the relationship of the buccal and labial plate of alveolar process. We find three distinct types of outer plate, and, when force is utilized as the only medium of tooth removal, three distinct

answers to the question as to what actually happens.

In type, we have a high, thin osseous formation which parallels the long axis of the tooth from the alveolar crest to a point near or opposite the root apex. The tooth having such an outer plate will be found forming a prominence on the dental ridge, the overlying process being extremely thin and of the same thickness for the entire length of the root. Under lateral pressure, such a tooth, which is supported on the buccal or labial aspect by this type of alveolar plate, will fracture the plate, generally into several splinters which spring outward to allow the tooth's dislodgment.

In type 2, we find the process thickening rapidly as it progresses from the alveolar crest toward the apex of the root. This thickening of the wall of alveolar process, against which the tooth is thrown outward, will result in fracture of the tooth at the neck. We find this type prevalent in the lower molar region, and the upper first and second molar regions; but a modified form of this massive alveolar plate may occur in any portion of the buccal or labial plate.

In type 3 of the buccal or labial process, we have a thickening of the alveolar crest and a thinning of the plate as it passes toward the apical third of the root, thus forming a well defined railing of the outer alveolar crest. This is the most common form of the outer plate, and when force is instituted in a lateral movement to dislodge the tooth from its socket, we find that fracture of the plate occurs in the form of a crescent-shaped segment of bone, which may carry the process upward with it to the thinner portion over the root apex and extend mesially and distally to include a portion of the interalveolar root septum, thus endangering the adjoining teeth.

If fracture of this segment does not occur, the tooth is liable to fracture at the neck. Not only will a large segment of bone fracture, but also, as the fracture occurs, releasing the force of the lateral pressure against the overlying gum tissue, laceration of this tissue may occur. As it was understood that, under ordinary pressure extraction, the outer plate would expand or fracture, we must realize the damage of an immediate and ultimate nature which was thus accomplished. The immediate result was laceration of the gum tissue and loss of dental ridge form, and the postoperative result was pain from a remaining expanded plate and the possibility of sequestration of the loosened segment at a later date.

We find that as the facial type changes to the square, more compact form, the malar process is decidedly lower and this section markedly thickened. In extreme cases of low malar processes, the buccal plate of the first and second molar will flare sharply outward to form the malar process, and thus these teeth be placed in a more or less solid mass of bone.

The relative position of the anterior border of the ramus, known as the external oblique line, will alter the type of buccal plate found in the first, second and third molar regions of the lower arch. While this relative position, mesially or distally to the second molar, which is taken as an arbitrary point from which to measure, is not peculiar to facial type, it has a marked influence on the buccal plate and also on the accessibility of an operative field in this region. Palpation of the external oblique line of the ramus will disclose these variations and indicate its influence on the retromolar area and buccal plate of the lower molars. The variations in the position of the ramus may be classified as 1, 2 and 3.

Class 1 is the extreme distal position of the ramus in its relation to the distal surface of the second molar, whereby there is a definite distal continuation of the ridge form allowing easy access to the third molar area and through the alveolar process buccally to the molar teeth.

In class 2, the anterior border of the ramus is advanced to a position buccally to the interproximal septum of the second and third molars, in which case the osseous structure rises more abruptly from the distal aspect of the second molar to form the retromolar triangle and flares more sharply outward from the buccal to form a shorter and thicker buccal plate. In this class, it is decidedly more difficult to obtain access to these areas for operative procedure.

In class 3, we find the anterior border of the ramus advanced to a position opposite the buccal groove of the second molar and the osseous substance of the retromolar area encroaching on the distal cusps of the second molar and overlying the cusps of the third molar, which may be in normal relation to the second molar. The buccal plate of the first molar is short and massive and that of the second and third molars composed of the ramus itself. Great difficulty is encountered in gaining access to these areas in these types. The variations found in the relation of the ramus to the second molar's distal surface are the principal source of the difficulties encountered in removal of the lower impacted third molar.

The variation in anatomy is shown in many cases by the position of the coronoid process of the mandible when in a depressed position. When retraction of the muscular tissues of the cheek is attempted, the extreme depression of the mandible should be avoided, as this will bring the coronoid process downward and forward, interfering with retraction of tissue surrounding the tuberosity of the upper jaw. It is often found necessary, when operating on the upper unerupted third molar, to allow the teeth to come within a few millimeters of actual occlusion. We see this fact graphically illustrated in roentgenograms of the upper third molar and in the warning in textbooks to avoid the mistake of confusing the coronoid process with a possible unerupted tooth.

The lingual plate of the upper teeth will vary in thickness and form in direct relation to the palate height. A low palate, flaring more abruptly away from the lingual alveolar crest, will be associated with a thick lingual bone substance. When we find the low palate in the same case as the lower type of malar process, the upper first and second molars are invested nearly to the gingiva in a solid block of bone.

We also find that the presence of a heavy lingual bone plate increases the rigidity of all the upper teeth, making removal of a tooth more difficult. A higher type of palate vault causes the lingual plate to parallel the long axis of the tooth to a greater distance, and thus the dental ridge becomes more prominent. If the rigidity of this plate is lessened, the lingual movement of a tooth for its removal is allowed, as advocated in the past, and a deeper grasp on the tooth with forceps beaks becomes possible, as this alveolar crest will usually be found slightly resorbed.

The angle of the soft palate, after it leaves the distal border of the hard palate, governs the position and type of soft tissues distally to the tuberosity and the second molar of the lower arch. This variation has been classified as positions 1, 2 and 3 by prosthetists.

Class 1 is that palate which sweeps backward and downward in a gradual

drop, the lateral border attachments distally to the tuberosity being thus lengthened. We find in this class ability to retract the cheek, leaving the tuberosity well defined in its upward swing of the gum to the notch formed between it and the hamular process.

In class 2, it drops more sharply downward from the distal border of the hard palate, and thus the length of the gum tissue of the tuberosity is limited and there is difficulty in retracting the soft tissue to the buccal and distal aspect of the tuberosity.

With class 3, the soft palate drops abruptly from the distal border of the hard palate and the lateral junction of its attachment to the buccal soft tissues over the pterygomandibular ligament, causing a mass of soft mucosa to envelop the tuberosity and the retromolar or third molar area of the lower arch. We have in this class a distinct disadvantage of lack of soft tissue control in these areas and increasing liability to trauma and hemorrhage.

Under a discussion of the wide variations in normal anatomy, we must consider the relation of the antral floor to the apices of the posterior tooth roots. While no clinical indication of the exact relationship may be recognized, we should establish the position by roentgenographic examination. It is found that, independently of pathologic involvement, the thickness and form of the antral floor over these root apices vary to a marked degree, generally in relation to the height of the position of the antrum in the maxillary bone. We may find the antrum well above the apex of either root of the first molar, with the intervening bone thick and separating the antrum from the teeth with a mass of bone. Or we may find it dropping sharply downward to occupy the space in the bifurcation of the molar roots, it appearing in the roentgenogram that the apex of one or more roots penetrated the floor. The intervening bone is extremely thin in this type and readily subject to pathologic destruction or penetration through careless operative procedure. Also, the apices of the buccal roots of the first molar may have caused the antral floor to develop a marked prominence for the prevention of actual root penetration. Pathologic involvement of this type from the root of the teeth will create possibilities of antrum penetration by either surgical or pathologic means and offers distinct danger of fractured root fragments being forced into the antrum.

There is a distinct variation in the size of the tongue and the mass of sublingual tissue, and also an amazing difference in the power of the patient to control them. While the size is of some importance, the ability to control its position and movement is of much greater importance.

In some cases, it becomes nearly impossible to retract the tongue away from the field of operation in the lower part of the mouth with any form of retractor other than actual tongue forceps, which, of course, cannot be used in local anesthesia. A far better method is to recognize this condition and, by suggestion, to influence the patient to aid in every way possible. Surprising success may be had by this method, as it will be found that a patient unable to do what is asked at first, protruding when asked to retrude and vice versa, will learn rapidly. It should be considered in the same light as the inability of some patients to occlude the posterior teeth on the first attempt, until it is suggested that they bring the back teeth together, and even then it may require several attempts.

There is a decided difference in the ability to retrude the tongue as shown by

the fact that, while one patient may not be able to place the tip of the tongue against the palate back of the first molar line, there are others able to very nearly touch the distal border of the soft palate. This control, or lack of control, of muscle tension extends also to the sublingual tissue and materially alters the ease of access to operative fields in the lower part of the mouth.

We also find a great variation in the gum tissue. As entrance to the tooth or tooth root is obtained by way of the buccal or labial gum tissue, we find here a decided contrast in tissue depth and tone. The tissue may vary from a normal tissue-paper-like covering to a thick, tough, leather-like flap of mucoperiosteum.

The first requires the most delicate manipulation, and incision of such tissue should be avoided if possible. It is generally found that the depression between the prominences formed by the tooth or tooth root offers a thicker and safer area for incision, and no hesitation should be felt toward making one in this type, as such tissue is very apt to tear at the thinner portion anyway, which makes control of the lacerated margins extremely difficult.

The heavy type of gum tissue offers little difficulty in incision and flap formation, unless the tissue tone is so low, as the result of pathologic degeneration, that it will be lacerated by the most delicate touch. Constant attention should be given this phase of the problem in all cases previous to the making of an incision or the removal of a tooth.

In no other branch of surgery are found the mechanical problems met with in dental oral surgery. The removal of tooth substance from within the bone itself and the retention of the bone form so that it may function normally as a supporting basé for dentures require an intimate knowledge of the mechanical peculiarities of its composition. By mechanical peculiarities, I mean those conditions encountered in cutting and manipulation with operative instruments. The retention of form and production of proper post-healing contour must also require an intimate knowledge of the regenerative powers of bone and its investing tissues. Bone surgery necessarily involves surgery of the soft tissues, and it is only through the treatment of both tissues by proper surgical principles that the operation may result in successful preparation of the mouth for its denture-supporting duties.

The properties peculiar to bone which are of unusual interest in surgery of the mouth are the physical properties of cutting and manipulation and the processes of resorption and regeneration. Until the time of the introduction of surgery for the removal of teeth, these were limited to the process of absorption in most cases, as the physiologic phenomenon of resorption of the alveolar tissue was entirely relied on to prepare the dental ridge for reception of dentures; that is, the technic of denture construction was limited to the problem of overcoming the disadvantages of undercuts and prominent spicules of the alveolus. The question of regeneration of tissue lost through pathologic action or surgical abuse was limited to the question of healing the gums and to obtaining relief from pain for the patient. With the realization of the importance of proper mouth preparation for the support of dentures, and the refinement in denture construction technics, the question of regeneration was necessarily forced on us for solution.

With the question of regeneration before us, the natural result was an attempt to discover means for avoiding the destruction caused by the removal of many

teeth and the immediate correction by surgery of the uncertain results obtained in allowing the process of resorption to assume its usual course. In answer to these problems, there have been a variety of technics and instruments designed to accomplish their solution. While the resorption of bone and regeneration are at direct opposites in action, they are closely allied in the correct treatment of the edentulous ridge. And combined with them are those physical properties of bone which are encountered in surgery of these parts. To understand the physiologic action taking place in the dental ridge at the time of operation, it is essential to realize to what extent resorption normally occurs.

The tooth socket extends to a much greater depth than resorption will normally occur; that is, as long as the investing alveolus remains intact. Therefore, what actually occurs is a process of resorption and of regeneration, resorption taking place at the alveolar crest and regeneration from the socket apex outward. If the investing bone tissue of the tooth which forms the remaining socket is destroyed, the soft tissue or gums collapse into the area from whence the process was removed or destroyed, and regeneration takes place only to that point wherein the gums are healthily supported. It can be understood that the alveolus is the matrix which supports the soft tissue until regeneration occurs. This condition varies decidedly in surgery of different bone structures in the body.

It is possible to remove a section of the fibula for a matter of inches and yet expect regeneration and normal contour to result. The heavy investing structure of muscular tissue in that case acts as a matrix to support the periosteum in its normal position until osteogenesis is completed.

In direct contrast, we find the gum tissue overlying the periosteum wholly incapable of supporting itself to normal ridge contour and depending entirely on the alveolar process to act as a matrix for such support. It can be seen at a glance that the most careful consideration must be given to maintaining a balance between the process of resorption and regeneration, if the contour of the dental ridge is to be properly developed.

We can understand the process of resorption as an act of Nature to consolidate the dental ridge and to eliminate those acute angles resulting from the ordinary extraction of a tooth, in the remaining process, thereby preparing what may be used to a remarkable degree as masticating surfaces even without artificial restoration.

The process of bone regeneration, while not completely agreed on, would, from information, experimentation and observation, seem to develop directly from the periosteal covering of the bone or a subperiosteal tissue. Whether this may have its source in the periosteum alone or in conjunction with a subperiosteal tissue has not been proved. However it may be established, the facts remain that as far as the dental ridge is concerned, it becomes impossible to develop bone to a point above that at which the periosteum may be healthily supported. Hence, it remains necessary to conserve, as a regeneration matrix, bone which will in contour and continuity support the periosteum and overlying gum tissue to a point slightly above that which is eventually desired in ridge height. It must be slightly above to allow for the certain resorption, of a slight degree, which will occur during the regeneration period. The closer the adaptation that may be had between the opposing and overlying margins of

the periosteum, the more rapid the regeneration and the less the resorption.

When the technic for the surgical removal of teeth was instituted to replace that of force, many ideas were advanced and advocated for the correct method in dealing with division and removal of overlying and encapsulating bone substances. A wide difference of opinion developed over the use of the bone bur or the chisel.

Claims that the surgical bone bur generated heat injurious to the osseous tissue, and that the circular action of the bur condensed the haversian canals and spaces in the cancellous bone, so as to inhibit the normal vascular action, were set forth as the predominating facts contraindicating their use.

It was argued that the chisel required too great a blow to accomplish the desired results, and that, as this instrument required access in more or less of a straight line, it was unwieldy.

To offset the claims of both sides, there were others who designed instruments to be used as a gouge, breaking and twisting the bone sufficiently to gain entrance to the tooth or bone area. The controversies between the advocates of the surgical bur and the chisel have proved both right and very much wrong. Abuse of each instrument is constantly brought to our attention, yet each has a definite place in dental oral surgery and, without either, success must suffer. The recognition of undeniable factors in the physical properties of bone will accentuate the necessity for the use of each where indicated.

Bone has been regarded as a dense nonfibrous substance, when, in truth, that does not always hold true in the osseous structure of the oral cavity. Only in areas of eburnation is this definite structure found. While the bone structure varies according to location, there is a definite association of composition with that of the enveloping tissue. We have, in some bones, a distinct resemblance to the fibrous overlying periosteum and connective tissue from which it is formed. These connective tissue fibers are found paralleling the long axis of the bone, as in the mandible, which is a long bone. The maxillary and mandible bones are of that type, having a definite fibrous composition which takes the form of the grain in wood. In the mandible, fibers traverse the entire ramus and continue downward and forward, following the curvature and angle of the junction of the ramus to the body of the bone.

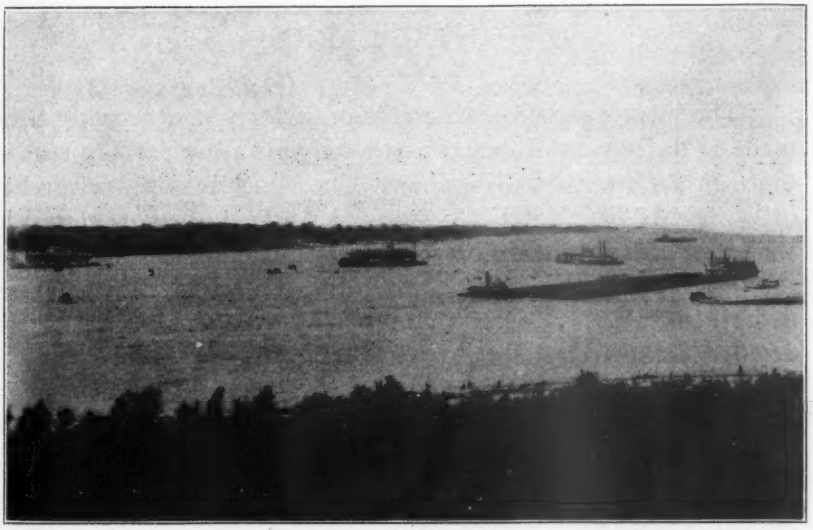
In experiments made on sections taken from these bones, we have been able to show to the naked eye these fibers as they follow the contours and the body of the bone. In the mandible, the fibers are plainly seen as they follow the descending anterior border of the ramus, downward and forward, to where they merge and continue with the fibers of the dental ridge where the external oblique line flattens itself on the buccal surface of the mandible opposite the second molar. By a process of decalcification, followed by dehydration and the infiltration of paraffin, it was possible to make microtome cuttings establishing these fibers microscopically and macroscopically. Surgical experience will show that this grain or fiber is widely found.

The tendency to split along the line of the long axis of the bone is easily shown in the reduction of any of the interproximal root septums. A chisel placed with the cutting edge parallel to the long axis of the bone will divide the septums from the crest downward and outward or inward, at whichever angle the chisel is held, at the slightest blow. The bone will split in the same manner as a section of dry log will split when

struck with an axe at a slight angle to the side, but with the bit parallel to the grain of the wood. It is further shown in chiseling the crest of the bone or buccal plate of the impacted third molar when cutting continues until the chisel comes to the upward trend of the ramus fibers. Here, the chisel stops and the cuttings will curl upward, one under the other, exactly as the wood of a stick will curl as it is shaved into a gnarled portion of the grain. These bone shavings are difficult to detach and require the same breaking action as the wood shavings, leaving the same type of surface, a rough and fibrous mass of bone.

Observation has shown the tendency of operators, in reducing interproximal root septums to the desired contour, to allow the bone forceps or chisel to split the septums at an angle so great that the lingual plate is left straight and the buccal surface at an acute angle from the lingual plate crest to the apical third of the tooth socket, a knife-edge ridge resulting similar to a chisel bit beveled on one side.

It has been our observation that recognition of these variations found in the normal structure of the oral cavity and the mechanical peculiarities of bone composition are of great importance in successful surgical interference for the removal of teeth.



Traffic on the Mississippi.

The Journal of the American Dental Association

212 East Superior St., Chicago, Illinois

C. N. JOHNSON, Editor

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Editorials

DENTAL CARIES

The large number of contributions which have recently been made to the subject of dental caries suggests a present day renaissance in the study of that subject. The epoch-making researches of W. D. Miller in 1880-1881 stimulated a great deal of interest in the cause and means of controlling this dental disease, but this interest subsequently subsided and the subject lay dormant for over thirty years. Public and professional attention was again aroused in the subject early in this century by the claims made for potassium sulphocyate in the control of dental caries, and then, a little later, this theory was abandoned for that regarding acid foods and fruits as preventive agencies. Neither of these theories were proved by practical application to be tenable, and they soon fell into disrepute.

During the past ten years, very substantial progress has been made as the result of intensive study of the bacteriologic and nutritional factors in dental caries. The contributions of May Mel-

lanby, Percy R. Howe, Clarence J. Grieves and the Michigan group mark a new era in the development of our knowledge of the subject. They have clearly shown that the tendency to dental caries is dependent not only on heredity, age, sex and bodily health, but also on the nutritional status of the individual. It is interesting to note that, just as the discoveries of Miller relative to the bacterial factors in dental caries followed almost immediately the work of Koch, who first established the bacterial hypothesis of disease, so also the nutritional studies in the dental field followed close on the heels of recent developments in the knowledge of general nutrition.

At the present time, considerable interest has been aroused in the study of dental caries as an expression of malnutrition. Extensive research and experimentation are now being conducted in various institutions throughout the world by which the hope of some practical solution of the problem is raised in the minds of the profession and the laity. In a few instances, reports have stated that, in relatively large groups of children who have been fed adequate and well-balanced diets, the occurrence of dental caries has apparently been greatly reduced. There is among the various workers in this field considerable variance of opinion as to the type of dietary program which is most beneficial in this regard. Some of the more important researches and points of view on this subject have been briefly stated in an article entitled "A Review of Recent Researches on Dental Caries," by Russell W. Bunting, in the May issue of THE JOURNAL.

From such a review of our modern research, it is evident that, among the research workers, there are several different schools of thought. There are those who believe that disturbances of nutrition favor the development of dental caries through the production of developmental and degenerative changes in the tooth itself, thereby making it less resistant to the disease. Others hold quite a different view, believing that nutritional states may influence dental caries through alteration of the salivary secretions and oral environment, which may accelerate or retard the characteristic action of the aciduric bacteria associated with the disease. Furthermore,

there are those who believe that for the prevention of dental caries, the most important food elements are calcium and vitamin D; others holding that vitamin C is the most important, and still others that the acid-base balance is the most weighty consideration.

It is evident that the question of dental caries is far from solved. We may view with satisfaction the progress that is being made in the study of the subject and a confidence that some enduring contribution may be forthcoming. It is very important that, in this period of interest and enthusiasm in the subject, we be not misled into the adoption of unproven theories as facts. We should possess ourselves with patience and view the situation with a scientific attitude. We should be ready at all times to accept newly established facts as truths, but very slow to subscribe to theories which are not in accord with previously established principles. If the newer theories do not harmonize with the old, it will require a considerable weight of authentic evidence to justify a radical change in principles which have withstood the test of time.

There is one consideration in which there seems to be practical unanimity of thought among all research workers, irrespective of their particular concept of the exact mechanism of the process; namely, that an adequate, well-balanced diet is apparently less conducive to dental caries than is an inadequate diet. Since all the nutritional programs suggested are practically in accord with the present-day views of normal nutrition and are optimum for the average individual, the recommendation of such dietary plans to patients who suffer from active and extensive dental caries is wholly defensible and may result in a marked improvement in dental health. In all such cases, complete case records should be kept and reported. It is only in this way that the efficacy and value of such preventive procedures can be definitely determined.

ADVERTISING IN THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

Everyone will concede that it is highly desirable to supervise most carefully the advertising in THE JOURNAL, and ever since

the organization of the Council on Dental Therapeutics, there has been an honest effort on the part of the advertising department to cooperate with the Council in the scrutiny of the advertising pages.

At the meeting of the Board of Trustees in February, 1931, a motion was made and carried that "the Business Manager, Secretary and Editor be given authority to make such changes as they see fit to improve the advertising and increase the advertising in THE JOURNAL." Accordingly, frequent conferences have been held with this object in mind.

In view of the vital interest of the Council in the advertising of proprietary products, it was deemed desirable to invite into these conferences the secretary of the Council, who undoubtedly is more familiar with the various products than anyone else, and who is located in the Central Office of the Association, where he is available at a moment's notice.

Accordingly, each month the advertising pages are being scrutinized by the four men indicated as soon as the "copy" is received. The wording of every advertisement is carefully considered and the decision is made on the basis of the following requirements: No new proprietary product is accepted for advertising in THE JOURNAL till such time as it has been submitted to the Council for investigation and has been found acceptable. In case of products already on the market or advertised, the Council shall be requested to investigate these products and pass on them, and no product is to be accepted for advertising without the favorable report of the Council, except in those cases in which a contract has been made between the Association and the manufacturer. In the case of an unfavorable report, the product shall not be advertised after the expiration of the contract already existing, and no new contract shall be made till the product is adjudged acceptable.

In those cases in which the products are already being advertised and the contract expires before the Council has had time to investigate them, no new contract shall be made till the Council has passed on them, but if there is a reasonable expectancy that the

product may prove acceptable, the advertisement may be continued from month to month pending the decision of the Council.

It should be remembered that the final decision on the various matters connected with THE JOURNAL automatically falls under the direction of the Board of Trustees of the American Dental Association, but it was felt that it was quite appropriate for those attending these conferences to come to the best conclusion possible till such time as the question could be further considered, if necessary, by the Board of Trustees.

It is the manifest desire of everyone interested to have the most equitable adjustment regarding advertising in THE JOURNAL, and to reform any questionable advertising as expeditiously as possible. If the pages of THE JOURNAL today are compared with those of former times, it will readily be apparent that considerable progress has been made, and the determination is firm on the part of all to continue this reform till the advertising is eminently satisfactory, with reference not only to the products themselves, but also to the claims that are made in the advertising copy submitted.

H. WOOD CAMPBELL

(1866-1931)

H. Wood Campbell was born July 9, 1866. in Amherst County, the son of the Rev. Thomas H. and Virginia Wood Campbell. He was graduated in dentistry from the University of Maryland in 1889, and from his entry into the practice of his profession until his untimely passing, his career was one of increasing honors with their attendant increasing duties.

He was president of the Virginia State Dental Association in 1894 and in 1895. His membership on the Virginia State Board of Dental Examiners dated from 1896 and this service of thirty-five years included twenty-eight years as president, which office he held until the day of his death.

He was known nationally and served as president of the National Association of Dental Examiners and also on the membership of a committee from that association to work in conjunction with the Carnegie Foundation to create a national board of dental examiners. His counsel was eagerly sought in such bodies. He served as president of the city council of Suffolk and was identified with every effort for the material and spiritual welfare of her citizens. The Virginia State Dental Association passed suitable resolutions on his death, which occurred last March 31, at his home in Suffolk, Va.

H. WOOD CAMPBELL
(1866-1931)

BUREAU OF DENTAL HEALTH EDUCATION

UNDESIRABLE HABITS INFLUENCING THE DECIDUOUS DENTITION*

By SAMUEL J. LEWIS, D.D.S., Detroit, Mich.

BEFORE considering the undesirable habits that influence the deciduous dentition, it may be well to spend a moment or two in clarifying what we mean by habit. The term is so commonly used in an opprobrious sense, as synonymous with bad habits, that it becomes easy to overlook its more general meaning, that is, the tendency to behave in fixed ways under given circumstances. These organized activities that we call habits are, as John Dewey says, the conditions of intellectual and physical efficiency. They often represent the crystallization of a preferred way of responding to a situation.

Bad habits are, of course, built up in the same way as good habits are, and may be as injurious as good habits are beneficial. Those who are responsible for young children are chiefly concerned that they should develop good habits, but, for some reason or other, most of them develop some bad ones. Those of immediate interest to us are sucking the thumb, finger, lip, tongue or cheek, or producing certain movements with the tongue against the cheek or teeth. All these undesirable habits may, by their very nature, become factors in the modification of the deciduous dentition. Nor are these habits as uncommon as one might suppose. Trained observers in the field of child study tell us that they constitute a common form of behavior in childhood. Thus, we are dealing with normal, rather than abnormal, behavior.

As regards the cause of these habits, there has been little in the way of careful investigation, and most of the theories advanced must be counted as merely speculative suggestions. Freud regards thumb-sucking as a manifestation of infant sexuality. Blanton and Blanton think that it is associated with the nutritive instinct. Other writers believe that the suppression of free activity gives rise to certain tics which really represent the escape, through smaller channels, of the energy which is denied expression through the larger movements. Some writers believe that the random movements of infancy, which may result in a fixed pattern of behavior through accident, are associated with certain undesirable habits. Thus, Blatz and Bott[1] state that a slight irritation on the lip may initiate a lip-pulling habit that will endure for months, perpetuating itself through the sensations derived from the act. From my observations, I believe

*Read before the Section on Mouth Hygiene at the Midwinter Clinic of the Chicago Dental Society, Feb. 5, 1931.

1. Blatz, W. E., and Bott, Helen: Parents and Preschool Child, New York: William Morrow and Company, 1929.

that some forms of thumb-sucking are produced in just this way.

Recently, Levy, of the Child Guidance Association in New York, observed a group of babies in private practice and in institutions and concluded that the most frequent cause of infantile thumb-sucking is insufficient lip movements; that is, an inadequacy in the sucking phase of the feeding act. He found that babies who fed from rapid-flowing breasts or bottles were more likely to suck their thumbs than were those who fed from breasts or bottles with a slower flow, and also that babies who were on a four-hour schedule

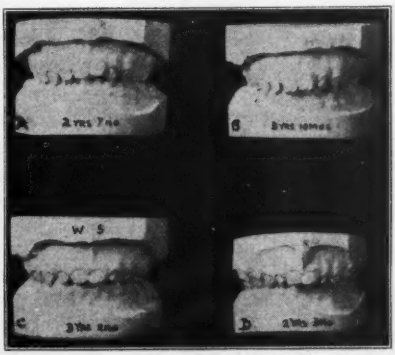


Fig. 1.—Models showing typical malocclusion caused by thumb-sucking. *A*, right thumb sucked; *B*, left thumb sucked; *C* and *D*, both thumbs sucked.

sucked their thumbs or fingers more commonly than did those who were on a three-hour schedule or on no regular schedule. If this describes the situation, it would seem that we shall have to look forward to even more thumb-sucking, since the four-hour schedule is followed in most hospitals and infants' homes. In Levy's group of forty babies on the four-hour schedule, 40 per cent sucked their fingers or thumbs. In our group of 131 babies on the four-hour schedule at the Sarah Fisher Home in Detroit, where we are making observations, 28.2 per cent sucked their fingers or thumbs. Whether or not the four-hour schedule and the length of the feeding period might be altered to remedy the situation, or must be maintained because of more important considerations, Levy's theory is an interesting one and deserves to be followed up.

Whatever the cause of these habits, no one questions that they have some influence on the deciduous dentition in certain instances. The textbooks show a wide variance of opinion as to the effect of these undesirable habits on the teeth and dental arches. There is little in the way of sound evidence to support these opinions. Hellman,[2] who found that thumb-sucking was correlated with Class 2, division 1, malocclusion (Angle's classification), was the first author to offer evidence of a scientific nature on the subject. Later, Lourie[3] stated, as a result of observations in his practice, that defective mastication, mouth-breathing, finger-sucking or thumb-sucking, and certain forms of malfunction or habits connected with the lips, cheeks and tongue may cause malocclusion, either primary, secondary or concurrent, or that these habits may result from malocclusion.

In 1924, when Ira A. Lehman and I[4] started to observe the growth changes of the teeth and dental arches of a group of preschool children in the Merrill-Palmer School in Detroit, I became greatly interested in the study of the effects of these

2. Hellman, Milo: Studies in Etiology of Angle's Class II Malocclusal Manifestations, Proc. Am. Soc. Orthodontists, 1921, page 76.

3. Lourie, L. S.: Some Abnormal Functions Associated with Malocclusion, J. A. D. A., 15:797 (May) 1928.

4. Lewis, S. J., and Lehman, I. A.: Observations on Growth Changes of Teeth and Dental Arches, Dent. Cosmos, 71:480-499 (May) 1929.

various habits on the deciduous dentition. In a group of 170 children under observation, sixty gave a definite history of having at one time or another indulged in one of these habits. The accompanying table shows the distribution of these

DISTRIBUTION OF UNDESIRABLE HABITS POSSIBLY INFLUENCING THE DECIDUOUS DENTITION, IN TWO GROUPS OF CHILDREN

Merrill-Palmer School

Total number of children examined	170
Number showing some undesirable habit	60
Percentage of thumb-suckers (of 170)	24.1
Percentage indulging in all habits	35.2

Distribution of Cases

Thumb-sucking	32
Finger-sucking	9
Nail-biting	4
Grinding teeth at night	8
Lip-biting	2
Nail-biting and grinding teeth	1
Mouth open at all times	1
Tongue-sucking	1
Sucking tongue and lower lip	1
Moving tongue against lips and teeth	1
Total	60

Sarah Fisher Infants Home

Total number of infants examined	131
Number showing some undesirable habits	37
Percentage showing some undesirable habit	28.2
Percentage of thumb-suckers (of 131)	20.6

Distribution of Cases

Sucking right thumb	20
Sucking left thumb	6
Sucking both thumbs	1
Finger-sucking	9
Lip-sucking	1
Total	37

habits, both in the Merrill-Palmer group and in the group of 131 children examined later at the Sarah Fisher Home.

The models of all the children at the Merrill-Palmer group who showed a definite history of having indulged in one of these habits were set aside and studied, to determine whether or not there was some effect on occlusion and whether any definite type of malocclusion was associated with these habits. Each child had a set of from three to seven models; that is, since the models were made once a year, these sets represented from three to seven years' observation of the cases. These models constitute a permanent record through which we are able to follow the local manifestations of growth in the teeth and arches.

The models of the thirty thumb-suckers included in the group showed, in twenty-four cases, a well-defined form of malocclusion. Six cases showed normal occlusion. Of the twenty-four cases of malocclusion, all showed a definite type of deformity characterized by a forward displacement of the upper anterior teeth and the premaxilla and, at times, by a retrusion of the lower anterior teeth. The displacement was usually toward the side of the thumb sucked; that is, if the right thumb was sucked, the displacement was toward the right; if the left thumb was sucked, the displacement was toward the left, and if both thumbs were sucked, the displacement was symmetrically forward (Fig. 1).

In no case was there a malocclusion simulating this form if the thumb was not sucked. It may be suggested that since we did not see these cases before the thumb-sucking occurred, we cannot be sure that the habit caused the malocclusion. However, the association of the habit with this definite type of malocclusion which we did not find in other cases led us to conclude that the habit must have caused the malocclusion. Later, we came upon a case which proved to us, at least, that thumb-sucking had caused the characteristic deformity observed. This

case will be considered later in the present report.

Figure 2 shows the occlusal phenomena associated with thumb-sucking in these thirty cases. It is interesting to note that, in all cases in which the thumb-sucking habit was broken by the sixth year, the malformation corrected itself without the aid of appliances. Figure 3 shows a typical case of self-correction. The first occlusion, with some of the permanent teeth already in place.

Figure 4 shows the models of a case which seems to offer conclusive evidence that thumb-sucking does cause this characteristic malocclusion. Here, the habit was broken by the fifth year, and the malformation then corrected itself. At 6½ years, the child again started to suck her thumb, with the result that the permanent

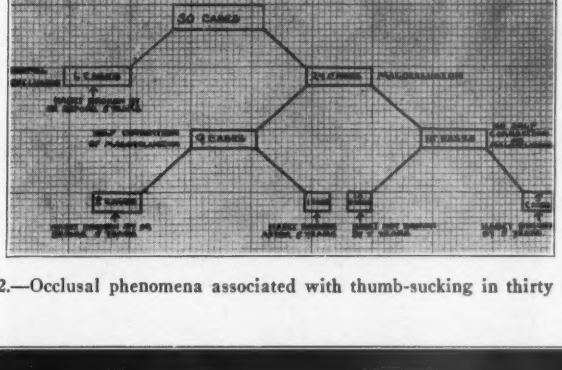


Fig. 2.—Occlusal phenomena associated with thumb-sucking in thirty cases.

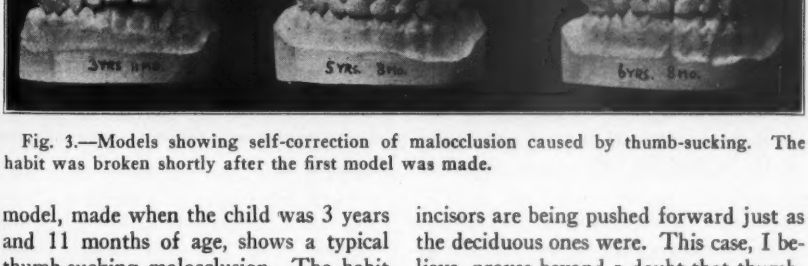


Fig. 3.—Models showing self-correction of malocclusion caused by thumb-sucking. The habit was broken shortly after the first model was made.

model, made when the child was 3 years and 11 months of age, shows a typical thumb-sucking malocclusion. The habit was broken shortly after this model was made. The second model, made at 5 years and 8 months, shows the self-correction that took place, and the third, made at 6 years and 8 months, shows continued

incisors are being pushed forward just as the deciduous ones were. This case, I believe, proves beyond a doubt that thumb-sucking may cause malocclusion.

Figure 5 shows the models of a case in which the habit was not broken and no self-correction occurred. As long as the thumb exerted a pressure on the teeth,

Nature could not make a correction. Figure 6 shows a Class 2, division 1, malocclusion in the deciduous and developing permanent teeth. The thumb-sucking habit has not been broken and there has been no correction.

Figure 7 shows the models of one of the most persistent thumb-suckers we had to deal with. No method of breaking the habit availed; the boy would suck his thumb whenever he had the chance. The boy placed his thumb sideways in his mouth more commonly than with the volar surface up, and so produced an open bite, besides a slight anterior displacement. As shown in the first four models, this condition persisted until he was past 5 years of age. At 6 years and 9 months, when the fifth model was made, the boy was still sucking his thumb, and the permanent incisors, while not fully erupted, had the appearance as in an open-bite condition. Shortly after this model was made, when the boy was about 7 years old, the mother informed me that he had suddenly given up the habit, though she could give no reason for his doing so. The sixth model, made when the boy was 8 years and 1 month of age, shows the open bite corrected and the anterior occlusion apparently normal. In the meantime, the boy had prematurely lost some of his deciduous molars, and this seems to have caused a posterior malocclusion. Though it may be said that the fifth model cannot be classed as an open-bite case, since the permanent teeth are only partially erupted, it should be noted that the open bite in the deciduous teeth persisted and that it has been observed in other cases that if the habit is not broken by the

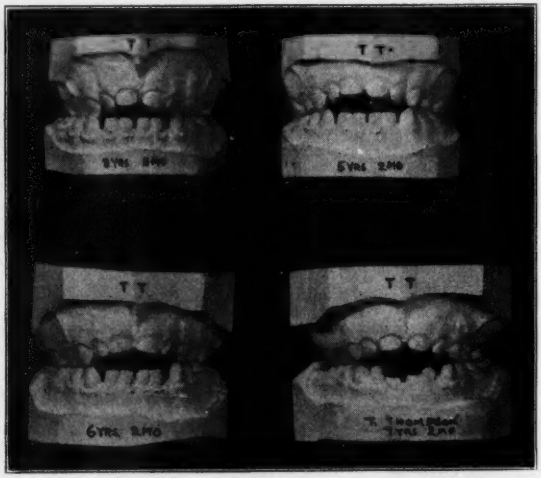


Fig. 4.—Three models of teeth of child shown in Figure 3; taken at 3 years and 9 months, 6 years and 2 months, and 7 years and 2 months, respectively. Model 1 shows the typical malocclusion caused by thumb-sucking; model 2, self-correction of the malocclusion after the habit was broken, and model 3, malocclusion in the permanent teeth following the resumption of the habit at 6½ years.

time the permanent teeth erupt, the permanent teeth fail to assume their correct position. This course of development is illustrated by the case shown in Figure 9. Milo Hellman has seen the models shown in Figure 7 and classes the case as one of open bite with self-correction.

There were also in the group nine cases of finger-sucking. The habit was started in all cases between the ages of 2 and 12 months, and in five cases was broken between the ages of 7 and 20 months. In these five cases, one showed normal occlusion, and another had normal occlusion at 4 years and 8 months, developed a malocclusion at 7 years and 3 months, and showed normal occlusion again at 8½ years. Figure 8 shows the course of development in this case. The other three cases showed malocclusion, distributed as follows: two Class 2 unilateral and one Class 2, division 2. In the four remaining cases, the habit was broken at ages varying from 2½ to 5 years. In three of these cases, the occlusion was normal, but, in one case, in which the habit was broken by the time the child was 6 years old, there is an aggravated type of malocclusion which seems to be growing worse.

Most of the children sucked more than one finger, and usually the fingers of the right hand. I should also mention that in five of these nine cases, the habit was broken before the case came under our observation, and, in the other four cases, while under our observation.

Though our series was too small to enable us to draw any valid conclusions, it does not seem to show any definite type of malocclusion caused by finger-sucking. The types of malocclusion that we found are also found in many cases uncomplicated by this habit. I do not mean to convey that finger-sucking may not cause malocclusion, but merely that we have not been able to find a definite type caused by this habit. Figure 9 illustrates what finger-sucking can do to occlusion. I did not see the deciduous teeth in this case, but the mother informs me that they were in the same position as the permanent teeth, as shown in the first model. In this case, correction of the malocclusion brought about a correction of the habit, further corroborating Lourie's statement that, in some cases, the habit and the malocclusion should be corrected at the same time, and that, in some cases, the correction of the malocclusion will automatically correct the habit.

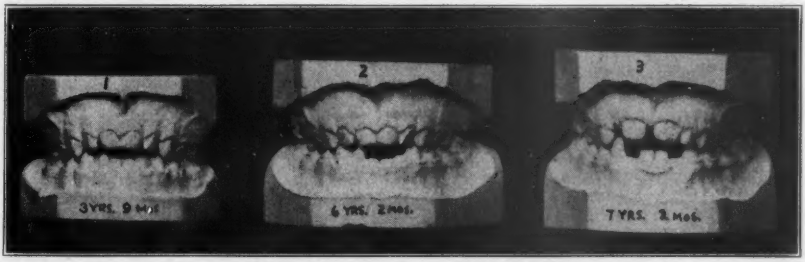


Fig. 5.—Typical malocclusion caused by thumb-sucking. Models taken at 3 years and 5 months, 5 years and 2 months, 6 years and 2 months and 7 years and 2 months. The habit was not broken and the malocclusion persists.

Of other habits which may be presumed to bear a possible relation to the

deciduous dentition, we had cases of nail-biting, tongue-sucking, lip-sucking, lip-biting and grinding of the teeth. We had not in any instance a sufficient number of cases to enable us to study specific types of malocclusion in relation to these habits, but some information was gained from an examination of the models and a study of the tabulation sheets. We found that a majority of the children who ground their teeth had normal occlusion. One child who indulged in this habit started with a Class 3 malocclusion and ended with an aggravated case of the same type (Fig. 10). Still another started with normal occlusion and ended with malocclusion, though not until the permanent teeth were erupting. In this particular case, the tabulation sheet shows that the malocclusion was caused by the premature loss of three deciduous first molars, and not by the habit. Of the children who bit their nails, all had normal occlusion in both the deciduous and the permanent series. One child who sucked his tongue had normal occlusion, but another who sucked his tongue and lips produced one of the most pronounced cases of malocclusion that I have ever seen (Fig. 11). One child who kept her mouth open constantly had normal occlusion in the deciduous teeth, but at 8 years and 4 months developed a malocclusion due to the premature loss of the three second deciduous molars. The habit had no relation to the malocclusion. Still another child who bit her lips had normal occlusion in both the deciduous and the permanent series. This particular case we

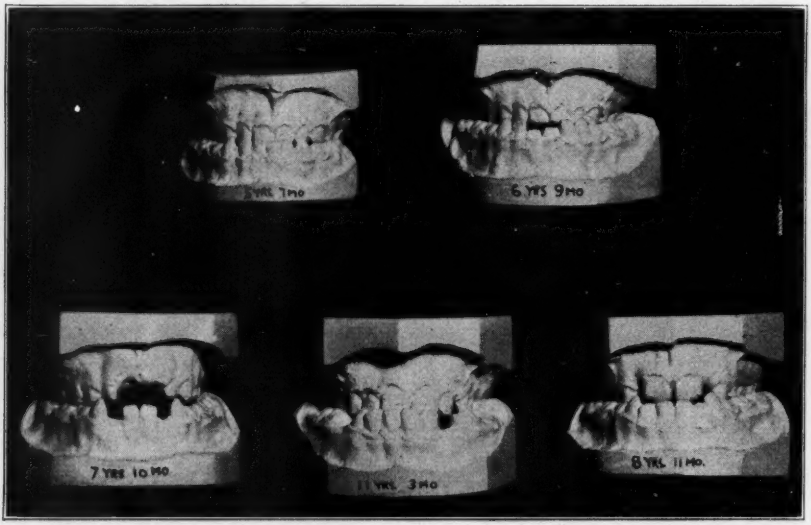


Fig. 6.—Models showing Class 2, division 1, malocclusion in deciduous and developing permanent teeth, caused by thumb-sucking. The habit has not been broken and no correction has occurred.

have observed for six years, though the habit was broken before the case came under our observation.

So we may say that, though we do know that certain undesirable habits of this kind may produce malocclusion of one type or another, there is yet much to be done in the way of research before we reach definite conclusions. Certainly, in our group, the only definite type of malocclusion that we could find was that caused by thumb-sucking. Perhaps as we are able to study these habits in larger groups of children, over longer periods, we may find other relations between these habits and dental occlusion. Our present findings are based upon nursery school children 18 months to 5 years of age at the Merrill-Palmer School, and we have had to resort to the questionnaire method of collecting data concerning the habits themselves, a method which is far from satisfactory. We are now beginning an enlarged program of study of the growth of the dental apparatus and related parts under a grant from the Children's Fund of Michigan founded by Senator James Couzens, and we shall be able to go farther into this study of habits influencing the deciduous dentition on the basis of first-hand observation of a group of children from birth to 16 years of age. In connection with our other studies, which will include recording the eruption of the deciduous teeth, making roentgenograms of the hands, elbows, and shoulders, recording the dietary, physical and disease histories and, later, making impressions of the teeth and of the dental arches, we are at present examining once a month a group of babies at the Sarah Fisher Home in Detroit and noting any habits of this nature that may manifest

Fig. 7.—Models of persistent thumb-sucker, showing open bite caused by sucking thumb placed in mouth sideways, and correction of open bite when habit was broken.

themselves. In this way, we shall be able to observe the early manifestations of these habits and their effects on the deciduous dentition in a way that I believe has not been attempted before. This program is of course a matter not of a few months, but of years. Until we have more data, then, we cannot be sure of ourselves with respect to the effect of most of these habits, except in certain isolated cases in which we have been able to observe the progress of events at first hand.

This much may probably be said: that the reasonable procedure in such cases of malocclusion complicated by one of these habits is to treat the habit first, to see if the malocclusion will correct itself, making models at regular intervals for observation, and in no case to institute mechanical treatment until such observations have been made. I do not mean to say that no case should be treated. Rather, I believe that, in well-selected cases, it may be well to treat the habit and the malocclusion simultaneously, as Lourie advises.

This brings us to a discussion of the treatment of these habits. If one is to believe the advertisements published in certain of the magazines devoted to child care and training, the sure cure for these habits is the use of such appliances as hand mits, elbow cuffs, thumb guards, etc. Our own observations and the reports of mothers convince us that this is not necessarily the case. While a few cases of thumb-sucking in our group were

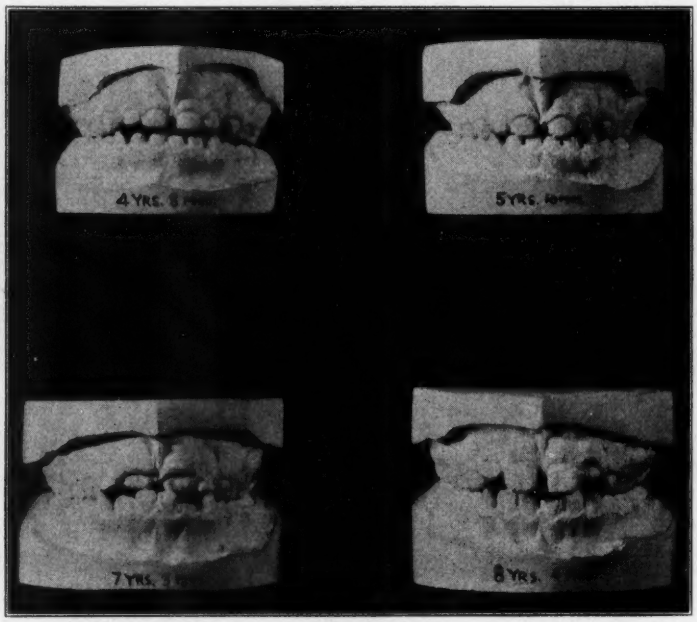


Fig. 8.—Models of finger-sucker, showing normal occlusion at 4 years and 8 months, malocclusion at 7 years and 3 months, and self-correction at 8½ years.

broken by the use of mechanical appliances, better results were achieved, on the whole, through the use of such methods as appeal to the "will power" and pride of the child. Though these methods, which we may call psychologic, do not work magically or without a good deal of persistence, the results are usually more lasting. I do not mean to say that mechanical methods should never be used. Naturally, one cannot appeal to the "will" or pride of a 2 or 3 month old

Fig. 9.—Models of finger-sucker in whom correction of malocclusion brought about correction of habit.

baby. I would suggest that in the case of young babies, Levy's findings be put to a trial; that is, that the baby be made to take a longer time to empty the breast or the bottle. We are going to try this method with our group of young babies at the Sarah Fisher Home and shall report our results later. With a young baby, the use of aluminum mits may be permissible, but they should never be used when the baby is learning to use his hands. I believe that elbow cuffs are better than mits, for, while they limit the use of the arm, they do permit the use of the fingers and hands. In my practice, the use of thumb guards has been unsuccessful, perhaps because I have never seen a thumb guard that could not be taken off by the child. One method that I have found successful in some instances is to have the mother place wooden tongue depressors in pockets sewn in the sleeve of the child's night garment, taking care that the cuff of the garment is small enough so that it will not slip over the elbow. This method is particularly good in the case of children who suck their thumbs or fingers at night. For new-born babies, one of the best methods is to place the baby inside a sleeveless garment or to keep the hands in the sleeves in some way. The swaddling clothes used by the American Indians and others were excellent preventives of thumb-sucking and finger-sucking, though they did untold damage in other ways.

Before discussing the suggestions we have concerning psychologic methods of dealing with these habits, I should like to say a few words about the "mirror method," of which I have made some mention.[5] The press spread news of this method widely, crediting me with originating the idea. Since then, several mothers have written to tell me that they have used the method and found it successful, one mother informing me that one treatment was sufficient. I must say that the idea was not an original one with me, that I used it only in carefully selected cases and then did not find it uniformly successful, and that, though

5. Lewis, S. J.: Thumb-Sucking: A Cause of Malocclusion in Deciduous Teeth, J. A. D. A., 17:1060-1073 (June) 1930.

the method may work at times when properly used, one cannot trust an uninstructed person, nor always an instructed one, to follow a suitable technic.

It is not within the scope of this paper to venture far into the treatment of these habits through psychotherapy, but certain simple suggestions that we can make as a result of our experience may be of help in one way or another. In the first place, the mother should realize that overanxiety or overemphasis in her attempts to break the child of thumb-sucking or some other habit may serve to fix the habit through calling the child's attention to a process that was largely automatic. In general, it is better to attempt to substitute some other form of interesting behavior for the habit, since this acts in a positive way, diverting the child's attention from the undesirable to something worth while. One of our mothers broke her child of the habit of sucking her fingers by merely telling the child that Goldilocks, whom the child admired, did not suck her fingers. In another case, the child sucked his fingers and at the same time performed an accessory movement with a blanket on his bed, and dropped the habit after a visit to his grandmother's home, where no blanket was available at the proper time. Here was a case of association; the child had to perform two movements at a time, with the blanket as a *sine qua non*. In general, it may be said that merely discussing the habit with the child or reproving him will do no good. Further, the mother should realize that these hab-

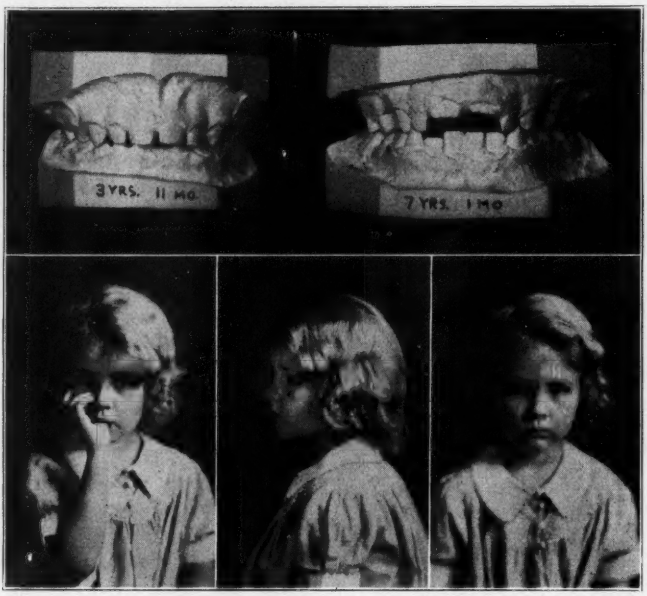


Fig. 10.—Models of teeth-grinding case, showing progressive Class 3 malocclusion.

its cannot be broken in a week or two, but demand persistent effort.

With habits involving organs of the oral cavity, such as tongue-sucking, lip-sucking and other habits of this kind, treatment is a more difficult problem, especially with younger children. In older children, one may be successful in diverting the attention to another type of behavior, but in persistent cases, where an open-bite type of malocclusion has been produced, it may be better to correct the malocclusion and attempt to get at the habit in this way. This method

Fig. 11.—Models of tongue-sucker and lip-sucker, showing pronounced malocclusion.

was successful in the case that I have reported (Fig. 9). As long as the space existed, the child sucked her fingers; when the space was closed, she gave up the habit. If the tongue or lip fits into a space occasioned by some form of malocclusion, whether of the open-bite or the protruding type, correcting the malocclusion will often eliminate the habit. The evidence is that it is also true that in children with an open-bite or thumb-sucking type of malocclusion, correction of the habit is often followed by self-correction of the malocclusion, and this may represent a good procedure to follow in most cases of undesirable habits associated with the development of the deciduous dentition.

SUMMARY

1. Concerning the cause of the various undesirable habits which bear a possible relation to the development of the deciduous dentition, such as thumb-sucking, finger-sucking and certain habits connected with the lips, tongue, and cheek, there has been little in the way of careful investigation, though a number of theories have been advanced. Special mention is to be made of the work of Levy, of the Child Guidance Association of New York, who finds that, in infants, thumb-sucking may indicate that the child has insufficient lip movements in feeding.

2. The textbooks show a wide variance of opinions concerning the effect of these undesirable habits on the teeth and dental arches, but there is little sound evidence to support the opinions held. Hellman

and Lourie were among the first to offer scientific evidence on the subject.

3. There is evidence that thumb-sucking causes a typical malocclusion in the deciduous dentition, characterized by a forward displacement of the upper incisors and the premaxilla, and, at times, a retrusion of the lower anterior teeth. The displacement is usually toward the side of the thumb sucked. Though some observations have been made with regard to the effects of finger-sucking, nail-biting, tongue-sucking, lip-sucking, lip-biting and grinding of the teeth, there are not a sufficient number of data to enable us to say whether these habits result in specific types of malocclusion. These problems are now being studied further in connection with our study of the growth of the dental apparatus and related parts.

4. On the basis of our experience, we may say that a reasonable procedure in treating cases of malocclusion complicated by such a habit as thumb-sucking is to correct the habit first and then to give the malocclusion time to correct itself, making models at regular intervals for observation, and in no case to institute mechanical treatment until such observations have been made. It is recognized that, in selected cases, it may be advisable to treat the habit and the malocclusion simultaneously.

5. Though mechanical methods of treating such habits as thumb-sucking may be useful in certain cases, especially with young children, psychologic measures were found more successful with the present group of children.

EDUCATION FOR DENTAL ASSISTANTS*

FLOYDE EDDY HOGEBOOM,† D.D.S., Los Angeles, Calif.

THERE are certain commercial pursuits which unquestionably belong to women. There are other pursuits which are equally open to men and women. There is a feeling abroad in the land that women are in many ways usurping man's legitimate fields of activity. This is sharply emphasized in periods of depression when millions of people are looking for a scanty livelihood; but one thing is certain, no woman is taking any man's job when she follows the vocation of dental assistant. The field of dental assisting is essentially a woman's field.

Another observation which I wish to make is that dental assisting is a type of service which is humanitarian, but is not a profession. It exists as a vocation not by its own primary strength, but secondarily to the dental profession. It exists because the dental profession must have helpers to serve the growing needs of the people along the lines of oral health service. Until some of these fundamental ideas are thoroughly understood, the educational background will be chaotic. Dental assisting is not a profession, but a vocation requiring vocational training;

*Read before the American Dental Assistants Association, Denver, Colo., July 22, 1930.

†Associate Professor of Children's Dentistry, University of Southern California.

but because this is a woman's work, which, in the majority of cases, is only a stepping stone, or rather "tide over," until a new home is started, the young woman should be permitted to gain not only vocational training, but also some slight knowledge of arts and sciences and possibly some of the humanities.

In one of her articles, your president makes the following statement: "The American Dental Assistants Association has each year petitioned the deans of the dental schools and colleges for the establishing of a course of training."

For many years, colleges have had what they were pleased to call preparatory schools. Now the growth of educational institutions has brought home the realization that these institutions have become, what one scholar called "educational barnacles." They are gradually disappearing. A dental college is a highly specialized professional school for the training of dentists, and particularly in dental technic. A recognized, well-balanced course for dental assistants would be an "educational barnacle" on a dental school. There are two subsidiary classes of dental helpers who can legitimately lay claim to dental college training, and that is the dental hygienist and the laboratory technician. These come under the observation of the dental school faculty, because they are purely vocational. Then where does the dental assistant belong educationally?

There is a large group of young people in this country who do not have the opportunity to spend many years in universities. There are many young people who are wasting time going to higher institutions of learning and many have gone who do not belong there. Realizing that

COURSE OF INSTRUCTION*

First Year

First Semester	*Units*	*Second Semester*	*Units*
English 51	3	English 52	3
Biology 51	3	Biology 52	3
Chemistry 51	4	Chemistry 52	4
Social arts 67	2	Psychology 51	3
First aid (civic health 23)	1	Community health (civic health 20)	1
Business economics 51	3	Nursing (civic health 24)	2
Physical education	½	Physical education	½
	16½		16½

Second Year

First Semester	*Units*	*Second Semester*	*Units*
Secretarial accounting 63	3	English 63	3
Typewriting 59	3	Typewriting 60	3
Stenography 55	4	Stenography 56	4
Bacteriology 51	4	Physiology 51	3
Community health (civic health 21)	1	Laboratory technic for dentists, or laboratory technic for doctors	3
Office methods 75	1		
Physical education	½	Physical education	½
	16½		16½

*Since this paper was read, there have been changes in the time allotted to some of the subjects. These are indicated in the Los Angeles Junior College catalog.

new institutions must be developed to care for the many sides of life in our democratic form of government, the junior college seeks to take the boy and girl from high school and prepare them for life. It is fitted to give the dental assistant the fundamentals of education as well as the fundamentals of technic required of her.

At this point, I wish to point out that this is what we term undergraduate training. The work done in study clubs and assistant associations will constitute her postgraduate course. Do not be confused on this point, because I am discussing the undergraduate phase only. At the invitation of the director of the Los Angeles Junior College, Dr. William Snyder, one of the foremost educators in this country, a committee of dentists composed of Leslie Eames, Charles Alderson and me, as chairman, aided by Dean L. E. Ford, worked out the course of instruction covering two years, given in the accompanying table.

In the second semester of the second year, a course in the rudiments of dental technic will be given by dentists covering approximately the following work:

DENTAL TECHNIC COURSE

Built on a basis of 9 hours, of 3 periods a week, 60 periods.

1. Outline of different materials used. (1 period.)

2. Plasters: coarse, rapid and slow setting; investments, stones, etc. (5 periods.)

(*a*) How to mix plasters free from bubbles.

(*b*) Carving of a square block of plaster to dimensions without bubbles.

3. Carving of one molar and one incisor tooth in soap or wax to approximately five times normal size. With this technic, the anatomy of the teeth is mastered. (5 periods.)

4. Waxes: baseplate, sticky, beeswax, different inlay waxes; the making of a square box of baseplate wax to learn how to melt and seal wax. (5 periods.)

(*a*) Carving a square or peculiar shape out of inlay wax to measurements.

(*b*) Investing this in inlay investment.

(*c*) Burning out.

(*d*) Casting.

(*e*) Checking for shrinkage or expansion.

5. Metallurgy. (5 periods.)

(*a*) Gold and gold alloys; how and where indicated; annealing and hardening gold.

(*b*) Amalgams; silver and copper; how mixed and when used.

(*c*) Polishing and finishing.

6. Casting machine. (1 period.)

(*a*) Air pressure.

(*b*) Centrifuge.

7. Inlay technic, direct and indirect preparation. (5 periods.)

8. Impression materials. (5 periods.)

(*a*) Plaster.

(*b*) Compounds, kinds and where indicated.

(*c*) How to run up an impression in soft plaster and hard stone.

(*d*) Trimming up a model into an artistic shape to dimensions.

9. Vulcanizers and vulcanite; what vulcanite is; where used and how the machines are run. (1 period.)

10. Soldering with a blow torch. (5 periods.)

(*a*) Simple little technic in which different carats of solder are used.

11. Porcelain ovens, use and care; simple technic of baking with low and high fusing powders. (2 periods.)

12. Roentgenography; types of machines; theory of x-ray emanation; technic of handling machine; films and angulation; darkroom technic (each girl to take a set of films, finish in dark room and properly mount); study of finishing solutions. (5 periods.)

13. Instruments and their uses; operating room care. (3 periods.)

14. Sterilization: chemical, steam and dry heat. (1 period.)

15. Medicines and remedies used in a dental office; their care and dangers. (1 period.)

16. Cements, how to mix. (1 period.)

(Remaining periods to take up slack or meet unforeseen circumstances.)

As dentists, we want every division of our working staff as efficient as possible, but we do not want our true calling, as

protectors of health, to become overshadowed by machine tendencies. Every one recognizes the perils to American life by the machine tendency of commerce, and how it tends to creep into our professional activities. We wish our assistants to be efficient, but we want them to be more than that. We want them to feel that they have a definite calling based on a good, well-rounded education.

We want them to be trained for a specific type of service, but educated to meet the larger situations in life as they arise. These are some of the aims that this new course at the Los Angeles Junior College hopes to accomplish.

AN INPATIENT DENTAL STAFF AND OPERATING ROOMS

By OLIVER WILSON WHITE*, D.D.S., D.D.Sc., Detroit, Mich.

IN the modern hospital, the development in efficiency due to improvement in building construction and modern equipment, together with the scientific management and training of those responsible for conducting the hospital, is so marked, it would seem that little constructive criticism regarding it can be offered. Yet we have today many hospitals that are not availing themselves of the benefits to be derived from an inpatient dental staff with efficient facilities to cooperate with the other departments.

I am associated with an endowed institution whose clientele is made up of underprivileged little patients who come into the world with many physical handicaps, and on account of their economic situation in the community, their conditions are aggravated instead of showing improvement, because of lack of proper care, proper diet, etc. Naturally, in a hospital with this class of patients, dental lesions are found in a very high percentage; in fact, more than 99 per cent of patients require some service of the dental division. A lower percentage would, of course, prevail in hospitals whose clientele are accustomed to receive periodical dental attention. It would be extraordinary if this ratio dropped below 65 per cent. It comes as a surprise to a great many of the dental and medical professions to learn in how large a number of patients admitted to hospitals the primary cause of the general physical condition is the dental condition.

For several years, dental and medical literature has contained articles showing that dental disorders are contributing causes of systemic ailments. Both professions have come to realize that diagnosis of systemic disturbances must include oral conditions, and oral diagnosis must depend on data regarding the systemic conditions for definite facts on which to base treatment. At this time, it would be impossible to enter into a detailed statement regarding all the advantages of cooperation between dental and medical hospital service, but I will mention three important divisions of hospital procedure which cannot hope to function without

*Director of Orthodontia and Dental Departments of the Children's Hospital of Michigan.

the assistance of a competent inpatient dental department.

1. The service that could be rendered by such a department to the nose and throat section is, of course, invaluable. It is a rule of the Children's Hospital of Michigan that all patients booked for nasal and throat operations shall have a clean bill of dental health before being admitted to the operating rooms. This service, of course, will be appreciated by anyone who has had the opportunity of examining the oral cavity of tonsil and adenoid patients on their admittance to the hospital, and after dental treatment for preparation for the removal of tonsil and adenoid tissue. I might state that observation on a number of these cases shows that oral conditions are the primary cause of throat infections.

2. The establishment of an inpatient dental department for the sole purpose of assisting in treatment of the heart patients would be justified in any hospital. I regret that the findings for our observation in the Children's Hospital of Michigan and other experiments being conducted throughout the state have not been published, but those interested are convinced that the elimination of all dental lesions should be one of the first steps in the treatment of heart cases.

Fig. 1.—Children's Hospital of Michigan; a modern equipped hospital dental operating room with staff, where efficient dental service is rendered patients in cooperation with the surgical, cardiac, and medical departments; equipped and maintained by the Children's Fund of Michigan.

3. In the medical department, the value of the inpatient dental department is seen in isolated cases rather than in groups but, in general diagnosis, it is

just as essential for the efficient hospital care of patients.

One of the first dental appropriations made by the trustees of the Children's Fund of Michigan was for the equipment and maintenance of a dental department for the Children's Hospital of Michigan. This made possible the proper handling of the dental problem of the hospital by a dental staff qualified to diagnose and treat all dental lesions.

The staff consists of director, assistant director, dental operator, oral hygienist, laboratory assistant and dental assistant.

The department functions by close cooperation with the cardiac, surgical, and medical staffs of the hospital. All incoming patients are examined as soon as possible, and dental conditions reported. Those physically fit to be moved to the dental department rooms are given permanent dental service; those in a more serious condition receive their examination in their ward, and temporary relief is given along with prophylactic measures to reduce the toxic condition of the mouth to as low a degree as possible. From observation to date, there is no question that the value of such a depart-

Fig. 2.—Orthodontia department of the Children's Hospital of Michigan, where crippled mouths are made to function. Orthodontic treatment is carried on simultaneously with correction of crippled conditions of legs, arms, etc.

The department equipment of a complete, modern operating room and laboratory (Fig. 1), also a complete, modern orthodontia operating room and laboratory (Fig. 2) and a complete dental x-ray and photographic department (Fig. 3) are shown herewith.

ment in a hospital is great. From a standpoint of efficiency in hospital care, dental treatment is required, not only in every children's hospital, but in hospitals for adults as well. The great expense and energy used in guarding patients from infections on entering and during their stay in the hospital is unsatisfactory if we allow the oral infections to remain unchecked. Without doubt, noncorrection of these conditions prolongs the patients' stay in the institution, and the convalescent period would for the same reason be extended.

Fig. 3.—Dental x-ray and photographic room in Children's Hospital of Michigan.

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The following articles have been accepted as conforming to the rules of the Council on Dental Therapeutics of the American Dental Association for inclusion in the list of Accepted Dental Remedies. The Council desires dentists to understand that the admission of an article does not imply recommendation. A copy of the rules which govern the Council in the consideration of articles will be sent on request.

Samuel M. Gordon, *Secretary.*

IODENT TOOTH PASTE No. 1.—*Composition:* Precipitated calcium carbonate, 55 gm.; soap, 6 gm.; glycerin, 34 gm.; petrolatum, 1.25 gm.; saccharin, 0.25 gm.; oil of peppermint, 1.0 gm.; water, 2.26 gm.; and iodids (as potassium and calcium), 0.24 gm.

IODENT TOOTH PASTE No. 2.—*Composition:* Precipitated calcium carbonate, 30.14 gm.; prepared calcium carbonate, 30.14 gm.; soap, 7.23 gm.; glycerin, 28.9 gm.; petrolatum, 1.51 gm.; saccharin, 0.30 gm.; oil of peppermint, 1.20 gm.; water, 0.30 gm.; and iodids (as potassium and calcium iodids), 0.24 gm.

Claims: The manufacturer has agreed to limit the claims to the cleansing properties. In reference to the claims based on an iodid content, the Iodent Chemical Company has advised the Council:

"That we, the Iodent Company, will maintain the position of making no therapeutic claims until such a time as we shall have procured further credible data by experienced investigators, of sufficient technical ability and critical sense, whose observations may be described in sufficient detail to permit verification, together with clinical evidence and objective data, with such citation of sources as will enable the Council to confirm the facts and establish the scientific value of the conclusions drawn; and in such event, we herewith further state that we will not alter our position; until the Council shall have the opportunity to examine all such material and data, upon our request for examination thereof, with opportunity of the Council to satisfy itself, as to the justification of any and all therapeutic claims for Iodent Tooth Paste that might be warranted thereby."

Manufacturers: The Iodent Chemical Company, Detroit, Mich. No U. S. Patent. Trade Mark No. 127,621.

HYCLORITE: A solution of chlorinated soda, each 100 gm. of which is stated to contain sodium hypochlorite, 4.05 gm., sodium chlorid, 2.50 gm., calcium hydroxid, 0.14 gm., inert salts, 0.65 gm. It contains not less than 3.85 per cent of available chlorin.

Actions and Uses: Hyclorite differs from solution of chlorinated soda-U.S.P. mainly because of the greater content of available chlorin and the lesser degree of alkalinity. Its actions and uses are similar to chlorinated soda U.S.P. When properly diluted, it also may be used in the same conditions as those in which surgical solution of chlorinated soda U.S.P. is indicated. One volume of hyclorite diluted with seven volumes of water has the same available chlorin content as surgical solution of chlorinated soda and is isotonic.

Dosage: Hyclorite is used full strength or diluted with one or two parts of water for direct application to mucous membrane, infected bone, etc. For irrigation of wounds and of throat and body cavities, dilutions of from 1:200 to 1:2,000 are used; as a mouth wash, 8-15 drops in a half-glass of water.

VIOSTEROL

Ergosterol, one of the sterols present in the fat of ergot, yeast and other substances when subjected to ultraviolet irradiation develops an antirachitic (vitamin D) potency, as tested on rats, usually many times that of good cod liver oil.

The term viosterol has been adopted by the Council on Pharmacy and Chemistry of the American Medical Association to designate irradiated ergosterol.

In order to avoid the danger of hypercalcemia, the substance is diluted for therapeutic purposes in inactive oils, such as olive or maize, and is designated viosterol in oil. The terms 10 D and 250 D have been provisionally adopted to indicate that it has been diluted to 10 or 250 times the vitamin D potency of good cod liver oil. The product is assayed by the same method as is used for determining the vitamin D potency of cod liver oil.

The use of viosterol in the treatment of rickets is well established. Prolonged administration to insure adequate calcium absorption and deposition, or as a prophylactic measure against dental caries, is still in the experimental stage.

Danger of excessive deposition of calcium in the body with the quantities ordinarily prescribed for treatment is apparently remote. The substance does not contain vitamin A, and for that reason cod liver oil preparations are ordinarily preferable for prophylactic purposes.

VIOSTEROL IN OIL 250 D.—Irradiated Ergosterol in Oil. Activated Ergosterol in Oil.—Viosterol dissolved in a vegetable oil and standardized to contain 3,333 rat units of vitamin D in each gram, this strength being 250 times that of a potent cod liver oil used as standard.

Actions and Uses: (See preceding article on viosterol.)

Dosage: Daily prophylactic dose for the average infant and child, from 8 to 10 drops (0.1233 to 0.1666 c.c.; 2 to 3 minims); for the premature and rapidly growing infant, 15 drops (0.25 c.c.; 5 minims); daily curative dose, from 15 to 20 drops (0.25 to 0.333 c.c.; 5 to 7 minims). In severe cases and for adults, doses in excess of 20 drops may be given. The marketed preparations are accompanied by a standard dropper designed to deliver 3 drops to the minim.

Viosterol in oil 250 D is standardized by comparison with a potent cod liver oil containing in each 0.75 mg., 1 rat unit of vitamin D, the rat unit being

defined as that amount of vitamin D which, when uniformly distributed into the standard vitamin D deficient diet-ration 2965 (*Jour. Biol. Chem.*, 64:263, 1925), will produce a narrow and continuous line of calcium deposits in the metaphyses of the distal ends of the radii and ulnae of standard rachitic rats.

Parke, Davis & Co.'s Viosterol in Oil 250 D.—A brand of viosterol in oil 250 D, N.N.R.

Manufactured by Parke, Davis & Co., under U. S. Patent 1,680,818 (Aug. 14, 1928; expires 1945) by license of the Wisconsin Alumni Research Foundation.

Parke, Davis & Co.'s Viosterol in Oil 250 D is prepared by dissolving crystalline ergosterol in purified ether to a definite concentration. The solution is then irradiated by exposure to ultraviolet rays from a lamp of the quartz mercury arc burner type. After irradiation, the ether is recovered and the ergosterol is dissolved in maize oil. The final dilution and the concentration is based upon the biologic assay and is adjusted to have the potency of viosterol in oil 250 D, N. N. R.

COD LIVER OIL WITH VIOSTEROL 10 D.—Viosterol dissolved in cod liver oil, the solution containing not less than 400 vitamin A units per gram, when tested by the pharmacopeial method, and 133.3 rat units of vitamin D per gram, this antirachitic strength being ten times that of a potent cod liver oil used as standard.

Actions and Uses: (See preceding article on viosterol.) **Cod liver oil with viosterol 10 D is proposed for use in conditions in which it is desired to supplement the administration of vitamin A with that of vitamin D.**

Dosage: For infants and young children, 2.5 to 3.3 c.c. (53 to 67 minims) daily; for adults and in severe cases, doses up to 7 c.c. (140 minims) or more are given.

Cod liver oil with viosterol 10 D is prepared by the addition of irradiated ergosterol to cod liver oil in such proportion that the finished product will contain not less than 400 vitamin A units per gram when tested by the pharmacopeial method and 133.3 rat units of vitamin D per gram, the rat unit being that amount of vitamin D which, when uniformly distributed in the standard vitamin D deficient diet-ration 2965 (*Jour. Biol. Chem.*, 64:623, 1925), will produce a narrow and continuous line of calcium deposits in the metaphyses of the distal ends of the radii and ulnae of standard rachitic rats.

Parke, Davis & Co.'s Cod Liver Oil with Viosterol 10 D.—A brand of cod liver oil with viosterol 10 D., N.N.R.

Manufactured by Parke, Davis & Co., Detroit, under U. S. patent 1,680,818 (Aug. 14, 1928; expires 1945) by license of the Wisconsin Alumni Research Foundation.

Irradiated ergosterol, prepared by the method described under Viosterol in Oil 250 D. Parke, Davis, is added to cod liver oil and the finished product is required to have a vitamin A potency of not less than 500 pharmacopeial units and to have the vitamin D potency of cod liver oil with viosterol 10 D. N. N. R.

INTRAVENOUS MEDICATION

The following special article has been prepared as one in the series of articles to be published by the Council on subjects dealing with pharmacology and therapeutics as related to dentistry. The Council has authorized the publication of the article.

Samuel M. Gordon, *Secretary.*

The proper scope of medication by dentists is in certain quarters a matter of active debate. Some hold that dental medication should be strictly limited to the local application of drugs; others hold there should be no limitation to the range of

medicaments or type of administration of drugs by the dentist; while others, of course, practice a middle course.

On the other hand, the situation is more simple in the minds of those engaged in selling medicinal preparations to the profession. Here, there is no active debate, and materials are sold with an assurance that is not always warranted. Passing over a general discussion of the various methods for administering drugs, for the time being, the Council desires to point out an unwarranted form of drug administration; namely, the intravenous method of administering drugs, especially when used thoughtlessly and indiscriminately.

This method of drug administration has been made the especial hobby of certain drug exploiters. The dramatics connected with the sudden effects of drugs thus administered has led many practitioners to adopt it as a routine measure of drug administration. Many active drugs, such as methenamin, the iodids, sodium salicylate, mercury bichlorid[1] and other preparations which exert a better and long lasting therapeutic effect when absorbed from the digestive tract have been exploited to the medical profession for intravenous medication.

There has also been an unwarranted amount of such medication with dyes in infectious diseases before adequate evidence of such usefulness has been made available or the necessary data on toxicity were available; with quinin in malaria, and with glandular products, despite the circumstance that little was known, not only of the chemistry, but also of the physiologic reaction of such preparations. Anesthesia by the intravenous route with barbitals is, on the other hand, sometimes used in biologic laboratories as a preliminary measure to experiments in other directions.

Of special interest to dentists is the recent advertising and detailing of the medical profession, especially surgeons, of several new derivatives of barbituric acid for the production of partial or complete anesthesia by the intravenous route. In order that the profession might be properly forewarned in the event that such advertising should come to it, the Council deems the matter of sufficient interest to place before the profession a general report on the inherent dangers of such medication. It can generally be agreed that new medicaments manifesting properites common to medical and dental practice are, as a rule, first introduced through the medical profession.

As is well known, the introduction of certain drugs into the system by the venous route may be necessary when other methods are not available. It is a common practice to supply the body with intravenous saline or dextrose in case of depletion of body fluids; or to treat syphilis by intravenous injections of arsphenamin. The intravenous injection of drugs, an old method, was given impetus after the discovery of the hypodermic syringe and the announcement of Ehrlich's discovery of arsphenamin for the treatment of syphilis. When another method is available, this method should be avoided as far as possible, because it produces greater risk to the patient without any compensatory advantage. When it is considered that the blood is a highly complex system of inorganic and organic substances in some form of colloidal equilibrium, it is readily apparent that the injection of foreign substances disturbs this equilibrium, sometimes with alarming and fatal results. Hanzlik and Karsner[2] have made a detailed study

1. "Some of Loesser's Intravenous Solutions"; Reports of the Council on Pharmacy and Chemistry, 1921, p. 43.

2. Hanzlik, P. J., and Karsner, H. T.: J. Pharmacol & Exp. Therap., 14:379 (Jan.) 1920.

of the effects following the intravenous injection of thirty-one substances. This group included both active and inert drugs such as acacia, dextrin and gelatin. Of the thirty-one agents studied, they found that only mild ether anesthesia and saline solutions were practically harmless. The others produced undesirably harmful reactions. The effects in general are an injury to the circulatory and respiratory systems as indicated by the presence of anaphylactoid symptoms, pulmonary distention, congestion and hemorrhage, together with cardiac dilatation. The results presented by these workers and subsequently confirmed and extended by workers in many countries, coupled with a wide review of clinical cases, are sufficiently conclusive to warn against the careless and unwarranted use of intravenous measures for administering drugs as a routine measure. Even such a simple and almost universally used solution as the normal saline (0.9 per cent sodium chlorid) must be injected with attention to detail. This solution is administered in general in cases demanding emergency treatment.

The barbitals are recognized as a group of drugs which yield well-marked hypnotic effects when administered by mouth. Within the last five years, several derivatives of barbituric acid, which possess more toxic properties and consequently require smaller amounts to bring about hypnosis, have been introduced to the medical profession for anesthesia by intravenous injection. Many samples have been distributed to various clinicians for trial. Many reports have appeared in praise of such agents for anesthesia, partial and complete, by this method. These may be dismissed with the remark that very little controlled evidence was submitted in these publications to show the dosage which may be employed with safety and the margin of safety between effective and toxic doses, the clinical signs by which the untoward effect of such anesthesia may be recognized and, more important, the adequate antidotal measures to be instituted in case of accident; nor is there evidence that intravenous administration presents advantages over oral. The history of the introduction of other newer derivatives is likely to be repeated in the present instance. Invariably, the trend of such knowledge has been that, with the introduction of each of these new derivatives of the barbitals, a group of supporters has made special claims for the anesthetic value of the derivative, later to be followed by less enthusiastic reports based on intensive observation by the more cautious.

The statements made in connection with the danger of intravenous therapy may be repeated with the barbiturates. They are among the worst offenders with respect to the variability of dosage required to produce similar effects, not only in different animals, but even in the same animal at different times. Deaths from barbiturates, particularly from the longer acting derivatives, recently introduced, in just fatal doses, are almost never the immediate result of a maximal concentration by the drug in the laboratory animal. Pulmonary complications resulting from deficient respiration and loss of body temperature are usually the direct cause of death in laboratory animals.[3] This situation is in line with the general effects mentioned under the general discussion of intravenous therapy and should further emphasize the fact that the greatest danger to the patient may not be merely the depth of the immediate depression induced, but may result from complications hours later.

3. Compare Fitch, R. H.; Waters, R. M., and Tatum, A. L.: Intravenous Use of Barbituric Acid Hypnotics in Surgery, Am. J. Surg., 9:110-114 (July) 1930.

When a drug of this type is injected intravenously, it is beyond reach as far as the anesthetist is concerned. He may hope that the patient has not received too much, but as far as effective treatment is concerned, in case he has given too much, there is little he can do. On the other hand, when it is administered in too great amounts orally, there is recourse to chemical antidotes by mouth, to eliminative measures and to intravenous dextrose as a partial antidotal measure, as recently reported by Luckhardt and co-workers.[4] Since the barbitals are well tolerated by and readily absorbed from the intestinal tract, and other satisfactory methods of anesthesia (ethyl chlorid, nitrous oxid-oxygen, ethylene-oxygen, procain, etc.) are readily available, the dentist should guard himself against over-enthusiastic reports, and uncritical advocacy of this method of drug administration. In view of the inherent dangers of intravenous injection, the Council cannot condone this type of medication for dental practice except in very special or emergency cases when other methods are contraindicated or have failed.

Nothing in this report should be construed against the proper use of the intravenous method in cases of emergency arising from postoperative procedures, or when conditions of the alimentary tract are such that medication by that route cannot be successfully accomplished. The users of an intravenous method should justify such usage by a knowledge of effects and exact indications for such medication.

4. Luckhardt, A. B., et al.: Control of Barbital Anesthesia and Poisoning by Diuresis, J.A.M.A., 95:576 (Aug. 23) 1930. Uses and Abuses of Barbitals, Report of the Council, J.A.D.A., 18:152 (Jan.) 1930.

BUREAU OF CHEMISTRY

MICO PYORRHEA SOLUTIONS
A Pyorrhea Cure on the Mail Order Plan

The following is a report of the A. D. A. Bureau of Chemistry.

Samuel M. Gordon, *Chief.*

WOULD you cure pyorrhea? Then send through the mails for a course of the treatment put out by the Mico Laboratories of St. Paul, Minn. The Mico people send through the mails their treatment, which consists of two solutions—Number 1, a pink colored liquid and Number 2, a dark, brown liquid. How one can treat pyorrhea by directions without regard to the individual attention to detail so necessary in these cases has apparently been solved by this promotion. The directions on the bottle apply to pyorrhea in all its forms. There appears to be a joker in the directions on bottle No. 1, namely, "After using both solutions for one week, let your dentist scale and clean your teeth."

Thus has the treatment of pyorrhea been so simplified that all one who is so gullible as to use the preparations needs to do is to order the treatment by mail and use as directed: "Then continue our treatment for three weeks and your gums will stop bleeding and assume a pink color and the teeth will become firm."

Because inquiries had come to the A. D. A. Bureau of Chemistry concerning this rapid-fire and ready-made method of curing pyorrhea, it was felt advisable to examine the preparations in order that the profession and the public might have some knowledge as to the composition. The chemist's report follows:

"Two (2) original packages of Mico Pyorrhea Solution (Mico Laboratories, St. Paul, Minn.) were received for examination.

"Each package contained one bottle of Mico Pyorrhea Solution No. 1 and No. 2.

SOLUTION NO. 1

"The following appeared on the label:

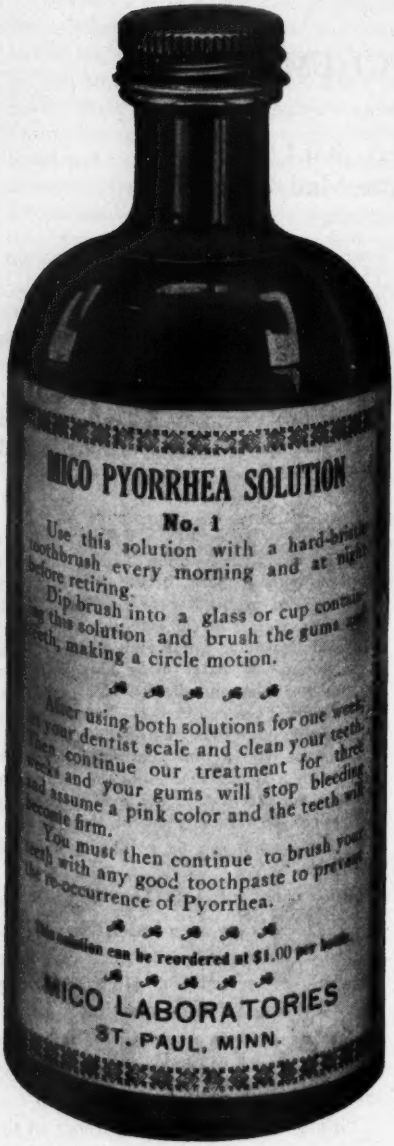
"Mico Pyorrhea Solution No. 1. Use this solution with a hard bristle brush every morning and at night before retiring. Dip brush into a glass or cup containing the solution and brush the gums and teeth, making a circle motion. After using both solutions for one week, let your dentist scale and clean your teeth. Then continue our treatment for three weeks and your gums will stop bleeding and assume a pink color and the teeth will become firm. You must then continue to brush your teeth with any good tooth paste to prevent the re-occurrence of Pyorrhea.

"This solution can be reordered at $1.00 per bottle.

"Mico Laboratories, St. Paul, Minn.

"Each package of solution No. 1 contained approximately 360 c.c. (12 fluid ounces) of a reddish, slightly cloudy liquid, having a neutral reaction to litmus and possessing an aromatic odor and a saline taste. A slight sediment was observed in the bottom of each bottle.

"There was a marked difference in the color and odor of both samples of Solu-


MICO PYORRHEA SOLUTION
No. 1
Use this solution with a hard-bristle toothbrush every morning and at night before retiring.
Dip brush into a glass or cup containing this solution and brush the gums and teeth, making a circle motion.
After using both solutions for one week, let your dentist scale and clean your teeth. Then continue our treatment for three weeks and your gums will stop bleeding and assume a pink color and the teeth will become firm.
You must then continue to brush your teeth with any good toothpaste to prevent the re-occurrence of Pyorrhea.
This solution can be reordered at $1.00 per bottle.
MICO LABORATORIES
ST. PAUL, MINN.

Mico Pyorrhea Solution No. 1 as it comes to the user.

tion No. 1. Sample A was decidedly pink, while sample B was orange. Sample A possessed an odor of creosote, while sample B possessed a cinnamon-like odor.

"The specific gravities were: Solution A, 1.0086; solution B, 1.0080.

"Qualitative tests indicated the following: sodium, chlorid, phenolic compounds. Calcium, sulphate, iron and magnesium were indicated in small amounts. Borate, carbonate, nitrate, phosphate, heavy metals (excepting iron), ammonium compounds and iodin liberating compounds were not found.

"Distillation indicated that the liquid was essentially water.

"Quantitative examination yielded the following:

	1-A	1-B
Solids	1.78	2.05 gm. per 100 c.c.
Ash (650 C.)	1.50	1.37 gm. per 100 c.c.
Sulphated ash	1.83	1.67 gm. per 100 c.c.
Chlorid (Cl^-)	0.90	0.82 gm. per 100 c.c.

"From the foregoing, it may be concluded that Micro Pyorrhea Solution No. 1 is essentially a 1.5 per cent solution of common salt to which has been added a dash of flavoring.

SOLUTION NO. 2

"Mico Pyorrhea Solution No. 2 was contained in a small brown bottle (equipped with a glass applicator).

"The following appeared on the label:

"Mico Pyorrhea Solution No. 2. Apply one drop of this solution on the gums around each infected tooth with the glass rod. Use this solution every night after solution No. 1.

"Each bottle of Solution No. 2 contained approximately 15 c.c. (one-half fluid ounce) of a dark, brown viscous liquid. Both samples appeared to be different, judging by the odors. Sample 2-A possessed no recognizable odor, while No. 2-B possessed an odor of iodin.

"Qualitative tests indicated the presence of iodin, iodid (I^-), zinc and gly-

cerin. Heavy metals (excepting zinc), sodium, potassium, ammonium compounds or phenolic compounds were not found.

"Quantitative determinations yielded:

	2-A	2-B
Free iodin	1.00%	1.97%
Total iodin		2.74%
Iodid (I^-) by difference		0.77%
Zinc (Zn^{++})	0.16%	0.18%

"On the basis of the foregoing, it may be calculated that a solution with properties similar to Mico Pyorrhea Solution No. 2 may be made by mixing 2 parts of iodin, 1 part of zinc iodid and sufficient glycerin to make 100 parts. Such a solution is essentially equivalent to one prepared by diluting 1 part of Talbot's iodoglycerol solution with 11½ parts of glycerol."

From the chemist's examination, it is readily apparent that Mico Pyorrhea Solutions No. 1 and No. 2 are essentially a dilute solution of salt and a dilute solution of zinc iodid and iodin in a glycerin medium. It is left to the Mico Laboratories to explain the difference in composition between different samples of Solution No. 2. It is again left to the promoters to explain how self-medication with such a solution will cure or prevent pyorrhea. Dentists who are in the habit of treating pyorrheic conditions know that, in general, each case of pyorrhea must be treated as individual. If medication is indicated, this can be intelligently carried out only by a careful diagnosis and supervision of the individual patient, as it is well-known that the nature of the disease is such that its treatment does not depend on any specific agent, but rather involves a group of therapeutic procedures, not the least important of which is careful attention to operative procedure.

The solutions may be prepared for a few cents, but the cost is negligible when one considers the harmfulness contained in the promotion of a product for the self-treatment of pyorrhea by the laity. The solutions may or may not do any real harm, but those who are gullible enough to use them in the hope of curing pyorrheic conditions are only deluding themselves because they deny for so much longer the treatment that only competent dentists can advise and administer in such deep-seated conditions as are found in some forms of pyorrhea.

The Mississippi River from the air. The twin bridge connects Memphis, Tenn., with Arkansas.

The Mississippi River from the air. The twin bridge connects Memphis, Tenn., with Arkansas.

AMERICAN DENTAL ASSOCIATION SEVENTY-THIRD ANNUAL SESSION

MEMPHIS, TENN., OCT. 19, 20, 21, 22, 23, 1931

OFFICIAL CALL

To the Members of the American Dental Association:

You are hereby notified that the Seventy-Third Annual Session of the American Dental Association will be held at Memphis, Tenn., Oct. 19-23, 1931.

The House of Delegates will convene at 10:00 a. m., Monday, October 19; the second meeting will be held on Monday at 2:30 p. m.; the third meeting on Wednesday, October 21, at 2:30 p. m., and the fourth meeting on Thursday, October 22, at 2:30 p. m. The four meetings of the House of Delegates will be held in the Ballroom of the Peabody Hotel. The Credentials Committee will register Delegates and Alternates, beginning at 10 a. m., Sunday, October 18, at the Peabody Hotel.

All other members will register at the Registration Office in the Memphis Auditorium. The Registration Department will be open from 9:00 a. m. to 5:00 p. m., Sunday, July 18, and from 8:30 a. m. to 5:00 p. m., Monday, Tuesday, Wednesday, Thursday and Friday, October 19, 20, 21, 22 and 23.

The general meeting which constitutes the opening exercises of the Session will be held Tuesday, October 20, at 9:30 a. m. The second and third general meetings will be held on Tuesday and Wednesday, October 20 and 21, at 7:45 p. m. The three general meetings will be held in the Ballroom of the Peabody Hotel.

The constituent societies are hereby notified to file with the Secretary of this Association, at least thirty (30) days prior to the first day of said Annual Session, a list of the names and addresses of their Delegates and Alternates.

ROBERT T. OLIVER, *President.*
HARRY B. PINNEY, *Secretary.*

GENERAL PROGRAM

Registration (General) ..... Sunday, October 18, 9:00 a. m.
(Memphis Auditorium)

Registration (Delegates and Alternates) ..... Sunday, October 18, 10:00 a. m.
(Peabody Hotel)

Board of Trustees (First Meeting) ..... Saturday, October 17, 10:00 a. m.
(Peabody Hotel)

Board of Trustees (Second Meeting) ..... Saturday, October 17, 2:00 p. m.
(Peabody Hotel)

House of Delegates (First Meeting) ..... Monday, October 19, 10:00 a. m.
(Ballroom, Peabody Hotel)

House of Delegates (Second Meeting) ..... Monday, October 19, 2:30 p. m.
(Ballroom, Peabody Hotel)

House of Delegates (Third Meeting) ..... Wednesday, October 21, 2:30 p. m.
(Ballroom, Peabody Hotel)

House of Delegates (Fourth Meeting) ..... Thursday, October 22, 2:30 p. m.
(Ballroom, Peabody Hotel)

PRELIMINARY PROGRAM FOR MEMPHIS SESSION

FIRST GENERAL MEETING
(Ballroom, Peabody Hotel)
TUESDAY, OCT. 20, 1931

9:30 a.m. Music (Orchestra)
10:00 Devotional Services
Dr. Thomas K. Young ..... Memphis, Tenn.
10:10 Music (Solo)
George L. Powers ..... Memphis, Tenn.
10:20 Address of Welcome from the State of Tennessee
Governor Henry H. Horton ..... Nashville, Tenn.
10:35 Greeting from the City of Memphis
Mayor S. Watkins Overton ..... Memphis, Tenn.
10:50 Address of Welcome from the Tennessee State Dental Association
Carl W. Hoffer, President ..... Nashville, Tenn.
11:10 Response of the American Dental Association
Homer C. Brown ..... Columbus, Ohio
11:25 Music (Solo)
George L. Powers ..... Memphis, Tenn.
11:35 President's Address
Robert T. Oliver ..... Philadelphia, Pa.
11:50 Music (Orchestra)

SECOND GENERAL MEETING

(Ballroom, Peabody Hotel)

TUESDAY, OCT. 20, 1931

7:45 p.m. Music (Orchestra)
8:00 Music (Violin Solo)
8:10 Address
8:40 Music (Violin Solo)
8:50 Music (Orchestra)

THIRD GENERAL MEETING

(Ballroom, Peabody Hotel)

WEDNESDAY, OCT. 21, 1931

7:45 p.m. Music (Orchestra)
8:00 Music (Solo)
George Kester.....Memphis, Tenn.
8:15 Address
8:45 Music (Solo)
George Kester.....Memphis, Tenn.
8:50 Music (Orchestra)

FOURTH GENERAL MEETING

(Ballroom, Peabody Hotel)

THURSDAY, OCT. 22, 1931

9:30 p.m. to 1:00 a.m. Grand Ball (Formal)
In honor of retiring President, Robert T. Oliver

Ellis Auditorium, Memphis, Tenn., where the Seventy-Third Annual Session of the American Dental Association will convene, Oct. 19-23, 1931.

CHAIRMEN AND SECRETARIES OF THE SCIENTIFIC SECTIONS OF THE AMERICAN DENTAL ASSOCIATION, 1931

THE SCIENTIFIC SECTIONS

TUESDAY, OCTOBER 20

OPERATIVE DENTISTRY, MATERIA MEDICA AND THERAPEUTICS

(Section Room C, Second Floor, Memphis Auditorium. All subsequent meetings will be held in this room.)

OFFICERS OF SECTION

Edouard M. Hall, Chairman.....Kansas City, Mo.
E. L. Knox, Vice Chairman...Dallas, Texas
R. W. Edwards, Secretary.Kansas City, Mo.

2 to 5 p. m.

Symposium on Pulpless Tooth Problems

"Morphology of Root Canals"
By William G. Skillen.....Chicago, Ill.

"Changes in the Peridental Membrane Associated with or Attributable to the Loss of the Pulp"
By John A. Marshall.San Francisco, Calif.

"Metastatic Lesions in Relations to Primary Foci"
By U. G. Rickert.....Ann Arbor, Mich.

"Root Resection and Pulpal Abscess"
By E. H. Hatton.....Chicago, Ill.

"Reactions in Living Tissues to Drugs Used in Root Canal Work"
By E. D. Coolidge.....Chicago, Ill.

"Pulpless Tooth Problems in Charitable Institutions"
By Alfred Walker.....New York City

"Shall We Have Specialists Who Do Only Root Canal Work?"
By Fred R. Adams.....New York City

"Correlation of Preceding Papers, with Diagnostic Deductions"
By J. R. Blayney.....Chicago, Ill.

FULL DENTURE PROSTHESIS

(Section Room A, Main Floor, Memphis Auditorium. All subsequent meetings will be held in this room.)

OFFICERS OF SECTION

Ralph L. Christy, Chairman...Denver, Colo.
Clyde H. Schuyler, Vice Chairman.....New York City
B. L. Hooper, Secretary.....Lincoln, Nebr.

2 to 5 p. m.

"Malrelation of the Endentulous Maxilla and Mandible"
By Alden J. Bush.....Columbus, Ohio

Discussed by
William R. Humphrey....Denver, Colo.
M. E. Niswonger.....Dayton, Ohio

"Instructions for the Edentulous Patient"
By B. L. Hooper.....Lincoln, Nebr.

Discussed by
George Wood Clapp....New York City
Harry J. Horner.....Pittsburgh, Pa.

"Anatomy of the Temporomandibular Articulation and Adjacent Structures"
By Harold L. Harris....St. Paul, Minn.

Discussed by
C. G. Porter.....Kansas City, Mo.
L. G. Cody.....Denver, Colo.

"Full Denture Construction from the Standpoint of the General Practitioner"
By F. C. Hughes.....Indianapolis, Ind.

Discussed by
Field Farrar .....Fort Worth, Texas
J. O. Hall.....Little Rock, Ark.

PARTIAL DENTURE PROSTHESIS

(Section Room B, Main Floor, Memphis Auditorium. All subsequent meetings will be held in this room.)

OFFICERS OF SECTION

F. F. Whitcomb, Chairman...Omaha, Nebr.
George W. Reynolds, Vice Chairman.... Minneapolis, Minn.
A. L. Walters, Secretary.....Tulsa, Okla.

2 to 5 p. m.

"Dental Decay and Duodenitis"
By John Harvey Kellogg (M.D.).....Battle Creek, Mich.

Discussed by
Arthur L. Walters.....Tulsa, Okla.

"Import of Children's Dentistry"
By F. Blaine Rhobotham...Chicago, Ill.

Discussed by
R. J. Rinehart.....Kansas City, Mo.

ORAL SURGERY, EXODONTIA AND ANESTHESIA

(Concert Hall, Main Floor, Memphis Auditorium. All subsequent meetings will be held in this room.)

OFFICERS OF SECTION

Earle H. Thomas, Chairman...Chicago, Ill.
E. C. Hume, Vice Chairman..Louisville, Ky.
Frank W. Rounds, Secretary..Boston, Mass.

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2 to 5 p. m.

"Advanced Radiodontic Interpretation"
By Clarence O. Simpson...St. Louis, Mo.

Discussed by
Charles F. Chandler..Montgomery, Ala.
Theodor Blum.....New York City

"A Practical Discussion of Block Anesthesia"
By Howard C. Miller.....Chicago, Ill.

Discussed by
Arnott A. Moore.....Buffalo, N. Y.
Charles W. Freeman.....Chicago, Ill.

"Value of Early Study of the Third Molars"
By Horace M. Davis....Baltimore, Md.

Discussed by
Frank B. Hower.....Louisville, Ky.
E. D. Bettenhausen.....Duluth, Minn.

ORTHODONTIA

(Section Room D, Second Floor, Memphis Auditorium. All subsequent meetings will be held in this room.)

OFFICERS OF SECTION

Max E. P. Ernst, Chairman.St. Paul, Minn.
Ernest N. Bach, Vice Chairman.Toledo, Ohio
Henry F. Hoffman, Secretary.Denver, Colo.

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2 to 5 p. m.

"Influencing Normal Development by Maintaining Function of Deciduous Teeth"
By O. W. Brandhorst.....St. Louis, Mo.

"Correlation of Concept and Treatment in Orthodontia"
By Andrew F. Jackson.Philadelphia, Pa.

"Analysis of the Dynamics of the New Angle Appliance"
By Ralph Waldron.....Newark, N. J.

PERIODONTIA

(Section Room E, Second Floor Memphis Auditorium. All subsequent meetings will be held in this room.)

OFFICERS OF SECTION

C. S. Kramer, Chairman.....
.....Colorado Springs, Colo.

Edward L. Ball, Vice Chairman.....
..... Cincinnati, Ohio

M. Monte Bettman, Secretary.Portland, Ore.

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2 to 5 p. m.

"Ultraviolet Ray Therapy in the Treatment of Periodontoclasia"
By A. T. Rasmussen....La Crosse, Wis.

"Treatment of Periodontoclasia by Subgingival Curettage"
By Arthur H. Merritt...New York City

"Diagnosis and Treatment of Periodontoclasia"
By Frank S. Kaiser..Los Angeles, Calif.

MOUTH HYGIENE AND PREVENTIVE DENTISTRY

(Section Room F, Third Floor, Memphis Auditorium. All subsequent meetings will be held in this room.)

OFFICERS OF SECTION

Edward F. Sullivan, Chairman.Boston, Mass.
E. A. Early, Vice Chairman.Darlington, S. C.
W. C. McBride, Secretary....Detroit, Mich.

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2 to 5 p. m.

"Development and Upkeep of the Dental Machine"
By E. Melville Quinby....Boston, Mass.

"Great Need of Cooperation Between Pediatrician and Dentist"
By Edward Clay Mitchell (M. D.)..
..... Memphis, Tenn.

Discussed by
Frank A. Delabarre.....Boston, Mass.

"Possibilities of the Dental Hygienist"
By Gladys I. Shaeffer (D. H.).....
..... Philadelphia, Pa.

HISTOLOGY, PHYSIOLOGY, PATHOLOGY, BACTERIOLOGY AND CHEMISTRY (RESEARCH)

(Section Room G, Third Floor, Memphis Auditorium. All subsequent meetings will be held in this room.)

OFFICERS OF SECTION

Edward H. Hatton Chairman..Chicago, Ill.
E. D. Coolidge, Vice Chairman.Chicago, Ill.
T. A. Hardgrove, Secretary.....
.....Fond du Lac, Wis.

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2 to 5 p. m.

"Clinical Research by the General Practitioner: A New Concept of Dental Research"
By James L. Zemsky....New York City

"Work of the Council on Dental Therapeutics"
By Samuel M. Gordon (Ph.D.).....
..... Chicago, Ill.

"Control of Dental Caries and Associated Degenerative Processes Through Reinforcement of Diet with Special Activators"
By Weston A. Price....Cleveland, Ohio

WEDNESDAY, OCTOBER 21
OPERATIVE DENTISTRY, MATERIA MEDICA AND THERAPEUTICS

(Section Room C, Second Floor)

9 a. m. to 12 m.

"Oral Diagnosis"
By Chalmers J. Lyons.Ann Arbor, Mich.

Discussed by
E. H. Westenhaver....Kansas City, Mo.
Roy S. Hopkinson.....Milwaukee, Wis.

"Children's Dentistry"
By Harvey J. Burkhart.Rochester, N. Y.

Discussed by
John M. Clayton.....Kansas City, Mo.
F. Blaine Rhobotham.....Chicago, Ill.

"Prophylaxis and Pyorrhea"
By Thomas B. Hartzell.....
..... Minneapolis, Minn.

Discussed by
R. W. Bunting.....Ann Arbor, Mich.
Edward L. Ball.....Cincinnati, Ohio

FULL DENTURE PROSTHESIS

(Section Room A, Main Floor)

9 a. m. to 12 m.

"Surgical Preparation and Conservation of the Dental Ridge for Dentures"
By Wilton W. Cogswell.....
.....Colorado Springs, Colo.

Discussed by
R. Boyd Bogle.....Nashville, Tenn.
F. P. Meyer.....St. Petersburg, Fla.

"Classification of the Edentulous Mandibular Ridge; Impression Technic for the Full Mandibular Denture"
By Ewell Neil.....Nashville, Tenn.

Discussed by
G. E. Tilton.....Wichita, Kan.
F. W. Fender.....St. Louis, Mo.

PARTIAL DENTURE PROSTHESIS

(Section Room B, Main Floor)

9 a. m. to 12 m.

"Denture Service Versus Salesmanship"
By R. J. Rinehart.....Kansas City, Mo.

Discussed by
Charles A. Furrow.....Tulsa, Okla.

"The Partial Denture"
By H. E. King.....Omaha, Nebr.

Discussed by
W. A. Warwick.....Tulsa, Okla.

"Plea for Healthier Environmental Tissues in Bridge and Partial Denture Construction"
By Herman A. Maves.....
..... Minneapolis, Minn.

Discussed by
Carl W. Hoffer.....Nashville, Tenn.

ORAL SURGERY, EXODONTIA AND ANESTHESIA

(Concert Hall, Main Floor)

9 a. m. to 12 m.

"Reduction of Gingival Flora Preceding Surgery"
By Harold W. Krogh. Washington, D. C.

Discussed by
C. H. Burmeister.....Cincinnati, Ohio
A. L. Frew.....Dallas, Texas

"The Dental Profile"
By Walter S. Thompson.....
.....Los Angeles, Calif.

Discussed by
John Oppie McCall.....New York City
Rea Proctor McGee...Hollywood, Calif.

"Systemic Effects of Pyorrhea and Technic for Surgical Eradication"
By Harry M. McFarland.....
.....Kansas City, Mo.

Discussed by
Boyd S. Gardner.....Rochester, Minn.
Menifee R. Howard.....Denver, Colo.

ORTHODONTIA
(Section Room D, Second Floor)

9 a. m. to 12 m.

"A Study of the Deciduous Molars"
By Frank A. Delabarre...Boston, Mass.

"Early Developmental Conditions Influencing Respiratory Obstructions"
By T. M. Robertson...Coffeyville, Kan.

"Cooperative Research on Wrought Alloys"
By N. O. Taylor (Ph. D.).....
.....Washington, D. C.

"Inherent Growth and Its Influence on Malocclusion"
By C. C. Howard.....Atlanta, Ga.

PERIODONTIA
(Section Room E, Second Floor)

9 a. m. to 12 m.

"Research in Periodontology"
By Harold J. Leonard..New York City

"Caring for Investing and Supporting Tissues in the Presence of Constitutional Disturbances"
By Irwin A. Epstein.....St. Paul, Minn.

"Influence of Periodontal Infection on Paranasal Sinuses"
By John J. Shea (M.D.).Memphis, Tenn.

MOUTH HYGIENE AND PREVENTIVE DENTISTRY
(Section Room F, Third Floor)

9 a. m. to 12 m.

"Behaviorism and Its Relation to Child and Dentist"
By C. W. Hagan.....Pittsburgh, Pa.

"Early Roentgen-Ray Diagnosis of Conditions in School Children"
By Leo J. Schoeny....New Orleans, La.

HISTOLOGY, PHYSIOLOGY, PATHOLOGY, BACTERIOLOGY AND CHEMISTRY (RESEARCH)
(Section Room G, Third Floor)

9 a. m. to 12 m.

"Preliminary Investigations on the Immunology of Dental Caries"
By Philip Jay.....Ann Arbor, Mich.
Mary Crowley (M.S.).....
.....Ann Arbor, Mich.

"Further Studies on the Recognition of Bacillus Acidophilus"
By Faith P. Hadley (M.S.).....
.....Ann Arbor, Mich.
Russell W. Bunting.Ann Arbor, Mich.

"Studies on Dental Caries in the Rat"
By Henry Klein.....Baltimore, Md.

OPERATIVE DENTISTRY, MATERIA MEDICA AND THERAPEUTICS
(Section Room C, Second Floor)

2 to 5 p. m.

"Inlay Casting"
By Emory O. West...Des Moines, Iowa

Discussed by
Herbert D. Coy.....Hamburg, Iowa
John J. Travis.....Ann Arbor, Mich.

"Gold Foil"
By Charles E. Woodbury.....
.....Council Bluffs, Iowa

Discussed by
George H. Mengel.....El Paso, Texas

"Occlusal Restoration and Bite Readjustment"
By E. E. Bailey.....Denver, Colo.

Discussed by
E. E. Welch.....Topeka, Kan.
John V. Brown.....Kansas City, Mo.

FULL DENTURE PROSTHESIS
(Section Room A, Main Floor)

2 to 5 p. m.

"Atrophy and Hypertrophy of Alveolar Process and Their Effect on Stability of Dentures"
By Frank H. McKevitt.....
.....San Francisco, Calif.

Discussed by
Frederick F. Molt.....Chicago, Ill.
W. H. Wright.....Pittsburgh, Pa.

"Immediate Denture Service"
By Sidney S. Jaffee..Washington, D. C.

Discussed by
Dayton D. Campbell..Kansas City, Mo.
Victor H. Sears.....New York City

"Apathetic Attitude of Denture Patients"
By W. M. Randall.....Louisville, Ky.

Discussed by
A. Alfred Nelson.....Detroit, Mich.
Charles M. McNeely...Brooklyn, N. Y.

PARTIAL DENTURE PROSTHESIS
(Section Room B, Main Floor)

2 to 5 p. m.

"Cooperative Research at the Bureau of Standards"
By Wilmer L. Souder. Washington, D. C.
George C. Paffenbarger..... .....Washington, D. C.
W. T. Sweeney...Washington, D. C.
A. Isaacs .....Washington, D. C.

"Distortion on All Wax Patterns When Heat Alone Is Applied"
By Theodore W. Maves. Cleveland, Ohio

ORAL SURGERY, EXODONTIA AND ANESTHESIA
(Concert Hall, Main Floor)

2 to 5 p. m.

"Relationship of Focal Infection of the Mouth and Teeth to Orthopedic Conditions"
By Willis C. Campbell (M.D.)..... ..... Memphis, Tenn.

Discussed by
Aubrey L. Martin.....Seattle, Wash.

"A Practical Discussion of Nitrous Oxid Anesthesia"
By Henry B. Clark.....St. Paul, Minn.

Discussed by
John W. Seybold.....Denver, Colo.

"Health Responsibility of the Dental Profession" ....
By Boyd S. Gardner...Rochester, Minn.

Discussed by
Harry Bear.....Richmond, Va.
Carlos H. Schott.....Cincinnati, Ohio

ORTHODONTIA
(Section Room D, Second Floor)

2 to 5 p. m.

"Fetishism of Nutrition"
By Richard Lowy.....Newark, N. J.

"Measuring the Face of the Growing Child"
By B. Holly Broadbent. Cleveland, Ohio
Charles B. Bolton...Cleveland, Ohio

"Theory and Practical Applications of Attachments"
By B. G. DeVries...Minneapolis, Minn.

PERIODONTIA
(Section Room E, Second Floor)

2 to 5 p. m.

"Treatment of So-Called Pyorrhea"
By G. R. Lundquist.....Chicago, Ill.

"Periodontoclasia as Revealed in the Roentgenogram"
By Henry Cline Fixott....Portland, Ore.

"Hypertrophic Gingivitis"
By Isador Hirschfeld....New York City

MOUTH HYGIENE AND PREVENTIVE DENTISTRY
(Section Room F, Third Floor)

2 to 5 p. m.

"Observations and Studies of European Dental Clinics"
By Malvina Wald.....New York City

"Mouth Hygiene and Preventive Dentistry from the Physician's Point of View"
By A. G. Jacobs (M.D.). Memphis, Tenn.

"Problems in Medical Oral Diagnosis"
By Ira J. Berlove.....New York City

"A Proposal to Standardize Toothbrushing"
By A. S. Chichester..Great Falls, Mont.

HISTOLOGY, PHYSIOLOGY, PATHOLOGY, BACTERIOLOGY AND CHEMISTRY (RESEARCH)
(Section Room G, Third Floor)

2 to 5 p. m.

"Bacteriology of the Pulpless Tooth (with Roentgenograms and an Improved Technic for Eliminating Contamination)"
By H. C. Cramer.....Milwaukee, Wis.
Allan F. Reith (Ph.D.)..... .....Milwaukee, Wis.

"Experimental Production and Eradication of Periapical Infection"
By William G. Downs, Jr..... .....New Haven, Conn.

"Cell Changes in Malignant and Other Growths of the Oral Cavity"
By Rudolf Kronfeld.....Chicago, Ill.

THURSDAY, OCTOBER 22

OPERATIVE DENTISTRY, MATERIA MEDICA AND THERAPEUTICS
(Section Room C, Second Floor)

9 a. m. to 12 m.

"Histopathologic Studies"
By W. M. Reppeto.....Dallas, Texas

Discussed by
Ralph R. Byrnes.....Atlanta, Ga.

"Methods and Results in Condensation of Dental Porcelain"
By J. Raymond Gill. San Francisco, Calif.

"Instrumentation in Cavity Preparation and Filling" (Illustrated by Moving Pictures)
By R. W. Rule....San Francisco, Calif.

Discussed by
R. K. Brown.....Ann Arbor, Mich.

FULL DENTURE PROSTHESIS
(Section Room A, Main Floor)

9 a. m. to 12 m.

"Intra-Oral Method of Registering Maxillo-mandibular Relations"
By Clyde H. Schuyler...New York City

Discussed by
F. M. Hight.....Houston, Texas
C. J. Stansbery.....Los Angeles, Calif.

"Relation of Tooth Position to Speech, Esthetics and Function"
By Francis Scott Weir...New York City

Discussed by
E. B. Owen.....St. Louis, Mo.
J. W. Crawford.....Milwaukee, Wis.

"Effects of Various Methods of Vulcanization on Rubber; Comparison of Vulcanite with Other Base Material"
By L. E. Weyer.....Iowa City, Iowa

Discussed by
Ira G. Nichols.....Champaign, Ill.
W. J. Pryor.....Cleveland, Ohio

PARTIAL DENTURE PROSTHESIS
(Section Room B, Main Floor)

9 a. m. to 12 m.

"Balanced Occlusion"
By Rupert E. Hall.....Chicago, Ill.

"Mechanics of Balance in Dental Prosthesis"
By Hugh W. MacMillan.....
.....Cincinnati, Ohio

Discussed by
Rupert E. Hall.....Chicago, Ill.
James Mark Prime.....Omaha, Nebr.

ORAL SURGERY, EXODONTIA AND ANESTHESIA
(Concert Hall, Main Floor)

9 a. m. to 12 m.

"Utilization of Radiopaque Solutions in Interpretation of Oral Lesions"
By LeRoy M. Ennis...Philadelphia, Pa.

Discussed by
George F. Seeman.....Nashville, Tenn.

"Relation of Focal Infections of the Teeth to Ophthamologic Conditions"
By E. C. Ellett (M.D.). Memphis, Tenn.

Discussed by
Joseph P. Wahl.....New Orleans, La.
A. P. Williams.....Louisville, Ky.

"Problem of Hypodermic Needles Broken in the Region of the Mandible and Maxilla"
By Theodor Blum.....New York City

Discussed by
Sterling V. Mead....Washington, D. C.

ORTHODONTIA
(Section Room D, Second Floor)

9 a. m. to 12 m.

"Orthodontia for the General Practitioner"
By H. A. Pullen.....Buffalo, N. Y.

"Developmental Conditions of Interest to the General Practitioner"
By Arlo M. Dunn.....Omaha, Nebr.

"Diagnostic Methods in Orthodontia of Value in General Dentistry"
By William H. Gilpatric..Boston, Mass.

"New Form of Orthodontic Mechanism, The Twin Automatic Appliance"
By Joseph E. Johnson....Louisville, Ky.

PERIODONTIA
(Section Room E, Second Floor)

9 a. m. to 12 m.

"Care of Soft Tissues Surrounding the Teeth of Children"
By Benjamin Kletzky.....Pueblo, Colo.

Symposium

"Relation of Diet to Dental Disease (A Preliminary Report on the Nutritional Study at Mooseheart, Ill.)"
By Milton Theodore Hanke (Ph.D.)..
..... Chicago, Ill.

"Blood Examination"
By Carl M. Marberg (Ph.D.).....
..... Chicago, Ill.

"Bacteriologic Studies"
By Winston H. Tucker (Ph.D.).....
..... Chicago, Ill.

MOUTH HYGIENE AND PREVENTIVE DENTISTRY
(Section Room F, Third Floor)

9 a. m. to 12 m.

"Hospital Dental Service in the Outpatient Clinics"
By S. W. A. Franken...New York City

Highway leading to Memphis.

"Economics of Mouth Hygiene and Preventive Dentistry"
By Samuel D. Harris.....Detroit, Mich.

"Dental Health Material, Its Editing and Publishing"
By Jacob G. Cohen.Minneapolis, Minn.

HISTOLOGY, PHYSIOLOGY, PATHOLOGY, BACTERIOLOGY AND CHEMISTRY (RESEARCH)
(Section Room G, Third Floor)

9 a. m. to 12 m.

"Infection with Monilia Following Extraction of Teeth"
By T. A. Hardgrove.Fond du Lac, Wis.

"Theory of Dental Caries"
By Theodore B. Beust....Louisville, Ky.

"Effect of Violet Ray on Calcium Metabolism in the Repair of Fractures"
By Roy S. Hopkinson..Milwaukee, Wis.

GENERAL CLINIC PROGRAM

THURSDAY AFTERNOON, OCTOBER 22—FRIDAY AFTERNOON, OCTOBER 23

GROUP 1: COLLEGE CLINICS

Baylor University, College of Dentistry, Dallas, Texas

"Oral Surgery and Radiology"
J. D. Eoff

"Casting Technic"
Philip L. Knutzen

"Prosthetic Technic"
J. T. Mullins

"Prosthetic Technics of the Freshman Class"
J. H. Pearce

"Dental Pathology"
W. M. Reppeto

"Dental Anatomy"
G. F. Woodbury

University of Illinois, College of Dentistry, Chicago

"Porcelain Inlays"
C. V. Shoskey

"Orthodontia"
Allan G. Brodie

"Various Types of Attachments and Fixed Bridges"
Stanley D. Tylman

"Pulp Canal Therapy"
J. R. Blayney

"Children's Dentistry"
Elsie Gerlach

"Orthodontia"
Burne O. Sippy

"Variables Produced in Amalgam Restorations by Changes in Manipulation"
T. W. Humble

Kansas City-Western Dental College, Kansas City, Missouri

"Casting Technic"
Leonard E. Carr

"Oral Surgery"
R. W. Edwards

"Impressions for Partial Dentures"
George W. Hillias

"Essential Factors in Full Denture Construction"
C. G. Porter

"Fixed Crowns and Bridgework"
R. J. Rinehart

University of Tennessee, College of Dentistry, Memphis

"Case Reports in Orthodontia"
W. E. Lundy

"Operation of a Children's Dental Clinic"
C. P. Harris

"Laboratory Procedure in Bacteriology and Pathology Applicable to Dental Practice"
M. T. Dean (M.D.)
R. D. Dean

"Casting Technic for Bridge Abutment Pieces"
F. C. Elliott
B. E. Griffing
P. N. Rhodes (Ph.D.)

"Gold Foil Restorations"
W. J. Templeton

"Amalgam Restorations"
W. A. Weyman

"Anatomic Restorations in Operative Dentistry"
G. C. Cox

"Taking Impressions and Registering Occlusion"
T. M. McCaleb

"Steps in College Orthodontia"
George M. Russell

"Cavity Preparation"
R. S. Vinsant (Dean)

GROUP 2: SECTION CLINICS

Operative Dentistry, Materia Medica and Therapeutics

"Occlusal Restoration and Bite Coordination"
E. E. Bailey.....Denver, Colo.

"Gold Casting"
Emory O. West.....Des Moines, Iowa

Full Denture Prosthesis

"Immediate Dentures"
Sidney S. Jaffe.....Washington, D. C.

"Effect of Atrophy and Hypertrophy of the Alveolar Process on the Stability of Dentures"
Frank H. McKevitt.....
.....San Francisco, Calif.

"Full Denture Impression Technic"
Ira G. Nichols.....Champaign, Ill.

"Various Methods of Vulcanization; a Comparison of Vulcanite with Other Base Materials"
L. E. Weyer.....Iowa City, Iowa

Oral Surgery, Exodontia and Anesthesia

"Exodontia: Preoperative and Postoperative Treatment"
Rush P. Abbott.....West Point, Miss.

Orthodontia

"Taking Impression of a Tooth To Be Banded"
Charles R. Baker.....Evanston, Ill.

"Orthodontia Technic"
B. G. DeVries.....Minneapolis, Minn.

"Models and Roentgenograms Showing Physiologic Changes at Different Stages of Development"
Arlo M. Dunn.....Omaha, Nebr.

"Orthodontic Appliances; Orthodontic Principles in Construction of Fracture Splints"
A. C. Gifford.....Oshkosh, Wis.

"Appliance to Stabilize the Dental Arch Before and During Eruption of Third Molars"
William H. Gilpatric....Boston, Mass.

"Treatment of Irregular Teeth in Cleft Palate and Hair Lip"
Guy M. Gillespie.....Abilene, Texas

"Effect and Adaptability of the Labial Auxiliary Spring in Orthodontic Treatment"
Andrew F. Jackson...Philadelphia, Pa.

"Value of Roentgen-Ray Films in Orthodontic Diagnosis"
Jesse F. Keeney.....Quincy, Ill.

"Standardized Basic Units for Constructing and Assembling Appliances"
Harry E. Kelsey.....Baltimore, Md.

"Physiologic Orthodontic Appliances"
Victor W. Lay.....Buffalo, N. Y.

"Extra-Oral Anchorage"
W. E. Stoft.....Omaha, Nebr.

"Maintenance of Function of Deciduous Teeth"
R. C. Willett.....Peoria, Ill.

"Cast Gold Retainers for Mature Cases of Orthodontia"
H. H. Sorrells....Oklahoma City, Okla.

Periodontia

"Periodontoclasia as Revealed in the Roentgenogram"
Henry Cline Fixott.....Portland, Ore.

"Hypertrophic Gingivitis"
Isador Hirschfeld.....New York City

GROUP 3: STATE ASSOCIATION INDIVIDUAL CLINICS AND GROUP CLINICS

Alabama

"Surgical Treatment of Periodontal Disease by a Conservative Flap Operation"
Olin Kirkland .....Montgomery

"Correcting Trauma in Natural Teeth"
A. K. Parks.....Montgomery

Arkansas

"Orthodontia as a Substitute for Bridgework"
Clarence W. Koch.....Little Rock

"Unilateral Saddle Bridge Without Posterior Attachment"
W. E. Williams.....Little Rock

"Alloy Restorations; Steps in Technic"
J. O. Hall.....Little Rock
P. C. Nordlinger.....Little Rock

"Improvements in Casting in 1931"
J. T. Peay.....Little Rock
W. G. Peay.....Little Rock

"I-Beam Slice Preparation for Fixed Bridgework"
Ellery C. Gay.....Little Rock

"Fixed Bridge Technic"
W. B. Dormon.....Nashville

"Standardized Casting Technic for Inlays"
F. G. White.....Fort Smith

"Modified Cavity Preparation"
W. T. Smith.....Walnut Ridge

"A Fracture of Maxilla and Palate." (Patient present)
H. J. Green.....Paragould

"Presenting the Case of Dr. Doe (A Study of the Economic Problems That Confront Every Dentist in the United States)"
C. B. Amis.....Little Rock
H. C. Berry.....Little Rock
Wayne Clark .....Little Rock
J. R. Luten.....Little Rock
F. D. Woods.....Little Rock

California (State)

"Building a Practice on the Human Side of Dental Economics"
Lester A. High.....Oakland

"Porcelain in Bridgework"
Elmer H. Berryman.....San Francisco

"Method of Controlling Investments to Produce Greater Density"
Thomas H. Forde.....San Francisco

"Treatment of Pulps in Deciduous Teeth"
John E. Gurley.....San Francisco

"Treatment for Exposed and Pulpless Deciduous Teeth"
Charles A. Sweet.....Oakland

California (Southern)

"Cases of Plastic Surgery and Exodontia" (Illustrated)
Arthur E. Smith.....Los Angeles
Barkley S. Wyckoff.....Los Angeles

"A Study of Mandibular Movements"
George M. Hollenback.....Los Angeles

"A Postgraduate Clinic in Operative Radiodontia"
Walter S. Thompson.....Los Angeles

"Metal Dentures by the Electrodeposition of Metals"
Jack LeRoy Loop.....Alhambra

Colorado

"Reproductions of Cases Showing Positioning of Posterior Teeth and Outline Form of Lower Dentures"
Ralph L. Christy.....Denver

"Wax Models of Practical Cases in Dental Oral Surgery"
W. W. Cogswell.....Colorado Springs

Florida

"Oral Diagnosis in Relation to Systemic Disorders—Oralogy"
M. F. Wielage.....Miami

Group Clinic

Jacksonville (Florida) Study Club

"Progressive Steps in Denture Construction"
A. W. Sears.....Jacksonville
John I. Todd.....Jacksonville
R. P. Taylor.....Jacksonville
C. J. Masters.....Jacksonville
H. B. Pattishall.....Jacksonville
L. W. Knight.....Jacksonville
W. G. Sherman.....Jacksonville
J. R. Lynn.....Fernandina

Georgia

"Gold Inlays"
Caldwell Holliday .....Atlanta

"Periodontia"
Robert L. Dement.....Atlanta

"Fractures of Mandible"
Joe Eberhardt .....Atlanta
Irwin T. Hyatt.....Atlanta

"Baked Porcelain Inlays"
D. Hoyt Simpson.....Atlanta

"Necessity of Making Bite-Wing Roentgen-Ray Films
Nathan T. Teague.....Atlanta

Group Clinic

Orthodontic Clinic by Georgia Orthodontists
H. L. Parks, *Chairman*

"A Résumé of Orthodontia Designed for the General Practitioner"

(*a*) History and Roentgenograms
F. F. Lamons.....Atlanta

(*b*) Classification: (1) Neutral Occlusion; (2) Distal Occlusion; (3) Mesial Occlusion
J. Roy Mitchell.....Atlanta

(*c*) So-Called Distal Occlusion
William Weichselbaum .....Savannah

(*d*) Deciduous Cases (1) That Should and (2) That Should Not Be Treated
W. B. Childs.....Macon

(*e*) Band Technic
Samuel W. Fennell.....Augusta

(*f*) Space Retaining Appliances
W. J. Childs.....Columbus

(*g*) Appliance Designing and Construction
H. L. Parks.....Atlanta

(*h*) Completed Records of Cases
H. H. Payne.....Atlanta

Illinois

"Buffered Procain for Increased Anesthetic Efficiency"
Charles W. Freeman.....Chicago

"Institutional Dentistry for Children." (Cook County Hospital Children's Dental Clinic).
Joseph L. Ubl.....Chicago

"New and Old Methods for Meeting the Problem Presented by Interproximal Roentgenograms"
Norman L. Kettlewell.....Chicago

"Orthodontia"
William W. Martin.....Chicago

"Interproximal Examination by the Use of the Bite-Wing Film"
O. M. Stewart.....Chicago

"Difficulties Encountered in the Removal of Teeth, Including Fracture of the Jaw"
B. J. Svoboda.....Chicago

"Elevator Technic"
Robert J. Wells.....Chicago

"Esthetic Considerations in Partial Dentures"
William R. Kern.....Chicago

"Metal Models for the Vulcanization of Full Dentures"
Joseph F. Porto.....Chicago

"Positive Pressure Technic of Impression Taking"
E. C. Pendleton.....Chicago

"Space Maintainers for the Prevention of Malocclusion"
Sidney Asher .....Chicago

"Selecting Teeth for Edentulous Patients"
Earl L. Richey.....Chicago

"Roofless Dentures"
Ray S. Cooke.....Chicago

"Comparative Properties of Various Denture Base Materials"
W. S. Rice.....Chicago

"Porcelain Jacket Crowns"
Loren D. Sayre.....Chicago

"Modification of Tooth Shades with Low Fusing Stains and Glazes"
W. R. Eberle.....Chicago

"Fixed Movable Bridge Using a Porcelain Root Tipped Cast Occlusal Dummy"
Edward G. Friedrich.....Chicago

"One Piece Cast Pin Inlays, Base Post and Core for Detachable Crown and Post and Core for Porcelain Jacket"
R. E. Groetzinger.....Chicago

"Fixed Bridge Abutments"
Harold W. Oppice.....Chicago

"Securing an Impression of the Cavity in Wax, and Making a Wax Replica of the Finished Inlay"
James L. Morlan.....Chicago

"Stress Breaker Bridges"
Sidney L. Rubens.....Chicago

"Gold Inlay Technic"
Leo S. Seidner.....Chicago

"Root Canal Therapy"
John H. Hospers.....Chicago

"Wax Expansion Technic and Investments"
A. J. Skupa.....Chicago

"Gold Inlay"
Clarence H. Burr.....Chicago

"Wax Expansion Technic"
Lester W. Boyd.....Chicago

"Technic for Fitting a Labial Arch Wire"
Leland R. Johnson.....Chicago

"New Ideas in Artificial Dentures"
George H. Henderson.....Chicago

"Casting Processes"
George L. Wood.....Geneseo

"Exodontia for the General Practitioner"
George Schneider.....LaSalle

"Partial Denture with Retention for Unusual Cases"
Edward F. Koetters.....Quincy

"Intra-Oral Stereoscopic Roentgenography"
E. S. Hodgson.....East St. Louis

"Full Denture Impressions"
R. R. Blanchard.....Springfield

Indiana

"Standardization of Splints for Maxillary Fractures"
Ralph O. Leonard.....South Bend
Robert F. Lucas.....South Bend

"Success in Denture Construction"
E. M. Dill.....Plainfield

"Low Fusing Technic for Staining and Glazing"
A. E. Herrold.....LaPorte

"Porcelain Inlay; a New Technic"
W. E. Kennedy.....Indianapolis

Iowa

"Toothbrushing and Gum Stimulation with Other Instruments"
W. J. Charters.....Des Moines

"Demonstrations of a Home-Made Furnace"
C. E. Woodbury.....Council Bluffs
Herbert D. Coy.....Hamburg
C. H. Stewart.....Farragut
J. H. Bang.....Hamburg
H. W. Sidwell.....Villisca
C. W. Steward.....Bedford
H. T. Dearborn.....Red Oak
T. I. Beckwith.....Corning
Max E. Brown.....Red Oak
F. M. Kelsay.....Villisca
D. W. Ireland.....Corning

Kansas

"Alveolectomy, Especially Before Extraction"
C. P. Elder.....Atchison

"Porcelain in Occlusal Cavities"
I. J. Jones.....Hutchinson

"New Instrument for Making Consistent Mixes of Porcelain or Cement"
C. S. Kile.....Hutchinson

"Operative Short Cuts"
J. B. Stevens.....Hutchinson

"Malocclusion Case with Seventeen Permanent Teeth Congenitally Missing"
Gordon L. Teall.....Hiawatha

"Orthodontia—Evolution of Appliances from 1907 to 1931"
H. B. Robison.....Hutchinson

Louisiana

"Cast Crown Requiring No Impression, Bite Nor Models"
Charles S. Tuller.....New Orleans

"A Technic of Dental Roentgenography for Children"
Leo J. Schoeny.....New Orleans

Maryland

"Casting Technic"
H. H. Streett.....Baltimore

"Repair by Cementum"
Myron S. 'Aisenberg.....Baltimore

Massachusetts

"New Method Using Porcelain Core for Porcelain Jackets"
Arthur T. Palmer.....Lynn

"Jaw Fracture Appliance"
Louis Gross.....Pittsfield

Michigan

"A Bridge—Principle and Construction"
E. B. Spalding.....Birmingham

"Fifth Nerve Anesthesia, Second and Third Division"
J. Orton Goodsell, Jr.....Saginaw

"Impression Technic for Metal Bases"
Melvin E. Page.....Muskegon

"Operative Clinics for Children"
W. C. McBride.....Detroit

"Clinical Possibilities of Periodontia"
Clayton H. Gracey.....Detroit

Minnesota

"Application and Design of Partial Removable Dentures"
George W. Boos.....Minneapolis

"Unusual Abutments"
R. R. Jones.....Minneapolis

"Amalgam; Economic Considerations and Literary and Clinical Attention"
Alfred Olson.....Minneapolis

"Practical Short Cut in Three-Quarter Crown Construction"
C. L. Lynn.....Redwood Falls

"Nitrous Oxid-Oxygen Anesthesia"
J. A. Heidbrink.....Minneapolis

"Vincent's Infection—Standardized Treatments Requiring but Two Appointments"
E. E. MacGibbon.....Minneapolis

"Sectional Plaster Impression Taken in a Single Tray at One Time"
Ralph H. Boos.....Minneapolis

"Upper Impression Postdamming Bite Plates; Primary Impression"
Clayton A. Swanson.....Minneapolis
Harold L. Harris.....Minneapolis

"Technic for Making Dies; Casting Bridges in One Unit and Inlays and Crowns to Dimensions"
F. S. Meyer.....Minneapolis
J. B. Towey.....Minneapolis

"Immediate Denture Service"
K. Paul Carson.....Minneapolis
Alfred W. Simonson.....Minneapolis

"Orthodontia of Interest to the General Practitioner"
W. J. Von Bank.....New Ulm
"Prophylaxis"
Raymond E. Johnson.....St. Paul

Mississippi
"Fixed Bridgework"
W. B. Smith.....Canton
N. H. Wallace.....Canton

Missouri
"Dimensional Castings"
J. D. White.....St. Louis
"Dimensional Castings"
E. L. Mayer.....St. Louis
"Dimensional Castings"
Max Kornfeld .....St. Louis

Montana
"Dry Socket Problem"
D. H. McCauley.....Laurel

Nebraska
"Torus Palatinus and Osteoma of the Palate"
G. M. Boehler.....Omaha

New Jersey
"New Angle Appliance"
Richard Lowy .....Newark
Ralph Waldron .....Newark
"Intra-Oral and Extra-Oral Roentgenography"
Henry W. Mustermann.....Leonia
"Full Denture Building for the General Practitioner"
Charles F. Harper..... ....Jersey City
"Partial Dentures"
Max M. Schwartz.....Jersey City

New York
"Burnished Gold Foil"
Leon R. Atwood.....Brooklyn
"Practical Application of Recently Improved Technics"
William M. Burns.....Brooklyn
"Treatment of Vincent's Infection"
Edward F. Mimmack.....Buffalo
"Roentgenogram in the Diagnosis and Prognosis of Periodontal Lesions"
John Oppie McCall.....New York City
"Detection of Proximal Caries by the Roentgenogram"
E. J. Nestler.....New York City
"Orthodontoscope in Record Keeping and Planning of Treatment"
L. M. Waugh.....New York City
"Simple Fracture of the Mandible"
G. G. Pritchard.....Buffalo
"Ultraviolet Ray Therapy for the General Practitioner"
Raymond C. Wells.....Brooklyn
"Simple Application of Elevators for the General Practitioner"
C. B. Frawley,.....Syracuse
"Technic of Spear Drill and Lever Technic for Recovery of Fractured Roots"
M. Hillel Feldman.....New York City
"Partial Impressions in Modeling Compound Without Trays"
Ellison Hillyer .....Brooklyn
"Some Practical Methods of Full Denture Prosthesis"
James P. Ruyl.....New York City
"Spring Lock Insertion Bridge in the Support and Retention of Removable Bridgework"
Ferdinand G. Neurohr...New York City
"Mouth Health from a Nutritional Standpoint"
Thomas P. McNulty....New York City
"Staining Artificial Teeth for Better Harmony of Prosthetic Restorations"
Francis Scott Weir.....New York City
"Stable Simplicity in Tooth Replacement"
Joseph A. Burgun.....Brooklyn
"Window Tray for Impression in Gingival Third Cavities"
Alfred Walker .....New York City
"Use of Matrix for Amalgam Filling"
John T. Hanks.....New York City
"Patterns for Castings by the Direct Method"
Simon Shapiro .....Brooklyn
"Porcelain Furnaces Embodying an Interchangeable Heating Element of Platinum Foil"
Andrew J. Asch.....New York City
"Root-Canal Measurement and Instrument Control"
Fred R. Adams.....New York City
"Reproduction of Set-up for Full Denture"
H. K. Taylor.....New York City
"Indications for Use of Mat Gold"
Paul W. Zillman.....Buffalo

North Carolina
"Indirect Casting Technic"
L. M. Edwards.....Durham
"Fixed Movable Bridgework"
Frank O. Alford.....Charlotte
"Cast Bridge Abutments and Inlays"
Ralph F. Jarrett.....Charlotte

"Method of Spot Grinding to Assist the General Practitioner in Establishing Balanced Occlusion"
L. G. Coble.....Greensboro
"Profile Roentgenography in Orthodontia"
Horace K. Thompson.....Wilmington
"Old and New Thought in Exodontia"
Harold E. Story.....Charlotte

North Dakota
"Rebasing Lower Dentures with Wax as an Impression Material; Vulcanite Trays to Hold Radium Tubes in Treatment of Cancer"
R. A. Ogilvie.....Grand Forks

Ohio
"Successful Abutment Castings; Porcelain Inlay"
R. P. Dressel.....Cleveland
"Partial Dentures and Periodontia"
Carlos H. Schott.....Cincinnati
"Pyorrhea Surgery" (Pictures and models)
P. K. Phillips.....Cincinnati
"Use of Stains in Creating Natural Effects in Artificial Teeth"
W. O. Hulick.....Cincinnati
"Casting to Backings"
Joseph J. Wittenberg.....Cincinnati

Oklahoma
"Method of Removing Difficult Roots"
J. A. Wells.....Shawnee
"Oral Surgery"
J. B. Jenkins.....Oklahoma City
"Roofless Dentures"
W. T. Jacobs.....Muskogee
"Investment for Repairing Bridges or Soldering"
A. E. Bonnell.....Muskogee
"Porcelain Art"
W. A. Warwick.....Tulsa
"Plaster Checkbite and Its Transfer to an Anatomic Articulator"
G. W. Andree.....Tishimingo

Pennsylvania
"Exodontia"
Agnew Irwin .....Philadelphia
"Modified Retainer in Orthodontic Treatment"
Charles H. Patton.....Philadelphia
"Periodontia"
Leslie Waddill .....Pittsburgh
"Space-Lock Grip Partial Dentures"
Rupert G. Beale.....Philadelphia
"Bridge Attachments Considering Conservation of Pulp and Tooth"
W. J. Robinson.....Philadelphia
"Correctible Compound Impression for the Edentulous Case"
William B. Rubin.....Philadelphia
"Facial Prosthesis and Oral Surgery"
W. J. Coverly Smith.....Philadelphia
"Cast Open Faced Crowns"
Louis Shrallow .....Pittsburgh
"Correction of Apparent Distoclusion"
F. W. Nash.....Scranton
"Flexibility in Orthodontic Treatment Employing Gentle Continuous Pressure"
Aubrey P. Sager.....Philadelphia
"Value of Irradiated Milk"
Charles M. Rist.....Erie
"Ultraviolet Therapy in Vincent's Infection"
John H. Greene.....Philadelphia
"Electrosterilization in Treatment of Periapical Infection"
Louis I. Grossman.....Philadelphia
"Preventive Dentistry (Case Histories)"
Fred D. Miller.....Altoona
"Jacket Crowns of Various Types"
Paul H. J. Simonsen.....Philadelphia
"Porcelain Jacket Construction"
C. S. Cuden.....Pittsburgh
"Use of the Roentgen Rays in Cavity Examination"
M. Lee Tarno.....Erie

South Carolina
"Fixed Bridgework"
E. W. Shepherd.....Spartanburg
"Anatomic Manipulation of Amalgam"
V. R. Hawkins.....Union
"Pinlay Abutment in Fixed Bridgework"
Frank Ferguson .....Greenville
"Impression Technic"
C. B. Simmons.....Spartanburg

South Dakota
"Technic of Denture Construction"
Raymond W. Ellis.....Salem
"Better Bridge Abutments"
E. D. Buettell.....Mitchell
"Casting of Mesioclusodistal Inlays and Full Cast Crowns by the Expansion Technic"
Glee H. Tarbell.....Watertown

Virginia
"Observations in the Field of Trauma with Especial Reference to Traumatic Occlusion"
Stephen Preston .....Roanoke

"Excursion Bites for Both Fixed and Removable Partial Dentures"
Richard L. Simpson.....Richmond
"Gold Crown Construction"
James E. John.....Roanoke

Washington

"Procain Injections with Special Reference to Intra-Osseous Technic"
Roy F. West.....Seattle

Wisconsin

"Modern Bridgework with a New Type of Stress Breaker"
A. H. Bassman.....Milwaukee
"Specific Treatment of Vincent's Infection" (Demonstration)
T. A. Hardgrove.....Fond du Lac
"Stereoscopic Profile and Intra-Oral Roentgenograms"
F. J. Martin.....Medford
"Result Obtained in Root Resections" (Illustrated by Roentgenograms)
O. H. Moen.....Watertown
"Prevention of Malocclusion by Orthodontic Procedure"
John S. Hollingsworth.....Sheboygan
"Gold Inlay Technic"
D. P. Nachazel.....Milwaukee
"Ultraviolet Therapy in the Treatment of Oral Diseases"
A. T. Rasmussen.....LaCrosse
"Inlay Technic"
L. P. Wagner.....Waupaca

GROUP 4: SIXTH DISTRICT CLINICS

"Gold Foil in Gingival Cavities"
George E. Aiken.....Kansas City, Mo.
"Porcelain Inlays"
C. F. Elsey.....Columbia, Mo.
"Closing a Bite and Increasing a Thirty Per Cent Masticating Efficiency to Ninety Per Cent"
T. E. Braly.....Chattanooga, Tenn.
"Porcelain"
E. F. Huckaba.....Chattanooga, Tenn.
"Root-Canal Therapy"
E. A. Jasper.....St. Louis, Mo.
"Operative Phases of Restoration and Reconstruction in Closed Bite Cases"
T. E. Kallenbach.....St. Louis, Mo.
"Porcelain Inlay for Posterior Tooth, Compound Cavity"
Russell C. Wheeler.....St. Louis, Mo.
"Technic for Casting Gold"
G. M. Zuccarello.....Nashville, Tenn.
"Preventive Dentistry; Operative Dentistry"
Hugh K. Kellogg.....Louisville, Ky.
"Preventive Dentistry"
Ray O. Lee.....Kansas City, Mo.
"Amalgam Restorations"
B. C. Gallimore.....McKenzie, Tenn.
"Quick Method of Repairing Broken Jacket Crowns and Inlays"
J. Bernard Hutcherson..Louisville, Ky.
"Analgesia and Anesthesia in Operative Dentistry"
B. H. Johnson.....Nashville, Tenn.
"Porcelain"
J. Guilford Sharp....Knoxville, Tenn.
"Practical Demonstration of a Roofless Denture"
Granville Sherman....Memphis, Tenn.
"Simplified Technic for Getting Perfect Models from Impression"
S. E. Bernow.....Nashville, Tenn.
"Alterations of Plate Teeth and Bridge Pontics with Mineral Stains"
James B. Jones....Murfreesboro, Tenn.
"Full Dentures"
Harvey C. Reese.....Nashville, Tenn.
"Full Dentures"
James A. Semones.....Bristol, Tenn.
"Metallic Models"
William E. Stack...Chattanooga, Tenn.
"A Denture in Forty-Five Minutes After Extraction"
F. Hubert Eversull..Kansas City, Mo.
"Artificial Tooth Modification"
Reed H. Gerard.....Kansas City, Mo.
"Modeling Compound Impressions"
B. L. Keeney.....Princeton, Ky.
"Full Dentures"
Ewell Neil.....Nashville, Tenn.
"Plaster Impressions"
J. O. Templeton.....Winchester, Tenn.
"Rubber Denture Duplication"
W. E. Ikard.....Decherd, Tenn.
"New Tissue Contact Bridge and Inlay Abutments"
Roy O. Bowles.....Charleston, W. Va.
"Fixed Bridgework"
W. B. Kirkpatrick....Hopkinsville, Ky.
"Carmichael Crowns"
O. D. Wilson.....Owensboro, Ky.
"Anterior Bridge Abutments"
John R. Beach.....Clarksville, Tenn.
"Prosthetic Restorations"
John V. Brown.....Kansas City, Mo.

"Simplified Technic for Cast Crowns"
William M. Davis.....Nevada, Mo.

"Removable Bridgework"
Charles P. Grosby.....St. Louis, Mo.

"Open-Face Crowns for Anterior and Posterior Bridge Attachments"
Y. E. Masterson.....Kansas City, Mo.

"Impressions for Pinlays; Direct Method"
R. W. Parmenter....Kansas City, Mo.

"Fixed Bridge Attachments"
William F. Stone...Chattanooga, Tenn.

"Locking Inlays for Fixed Bridgework"
Howell Boatner.....Springfield, Mo.

"Impressions for Partial Restorations, Using Plastic Material in Hydro Trays"
E. H. Westenhaver...Kansas City, Mo.

"Elevator Instrumentation in Removal of Fractured Root Fragments"
H. W. Allan.....Kansas City, Mo.

"Minor Oral Surgery"
C. V. Morgan.....Johnson City, Tenn.

"Responsibility Involved in Removing an Impacted Third Molar; from the Standpoint of the General Practitioner"
John W. Opp.....Hannibal, Mo.

"Removal of Mandibular Third Molar"
Edgar W. Smith.....Kansas City, Mo.

"Splints for Fractures of Bones of Face and Head, Bone Grafting"
Grover C. Smith.....St. Louis, Mo.

"Surgical Removal of Impacted Cuspid." (To be given in large operating room, General Hospital, 860 Madison Avenue, Friday at 10:00 a. m.)
Elvin P. Voyles.....Memphis, Tenn.

"Oral Surgery in the Eradication of Pyorrhea"
Harry M. McFarland.Kansas City, Mo.

"Rebuilding Mutilated Mouths"
Roy O. Elam.....Nashville, Tenn.

"Value of Occlusal View Films"
George F. Seeman.....Nashville, Tenn.

"Exodontia with Special Reference to Surgical Preparation of Mouth for Dentures"
J. L. Austin.....Chattanooga, Tenn.

"Orthodontia and the General Practitioner"
R. B. Coomer.....Louisville, Ky.
Joseph L. Selden.....Louisville, Ky.

"Orthodontic Impressions"
Harry A. Holder.....Nashville, Tenn.

"Placing Impacted Cuspids in Occlusion by Orthodontic Procedure"
A. C. Mogler.....St. Louis, Mo.

"Fixed Removable Orthodontic Appliances"
Leo M. Shanley.....St. Louis, Mo.

"Influencing Normal Development by Maintaining the Function of the Deciduous Arch"
O. W. Brandhorst.....St. Louis, Mo.

"Stationary Lingual Loop Appliance; Thumb Sucking Arch Appliance"
C. C. Byington.....Chattanooga, Tenn.

"Orthodontia"
Winston P. Caine...Chattanooga, Tenn.

"New Form of Orthodontic Mechanism, the Twin Wire Automatic Appliance"
Joseph E. Johnson.....Louisville, Ky.

"Orthodontic Model Holder"
W. K. Slater.....Knoxville, Tenn.

"Obstinate and Pronounced Distoclusion with Complications; Treatment Employed"
Hugh G. Tanzey.....Kansas City, Mo.

"Pyorrhea—Its Modest Management"
Thomas F. Bates.....Shelbyville, Tenn.
W. C. Rhodes.....Shelbyville, Tenn.

"Correcting Abnormal Conditions Following Injection into the Periodontium of an Intracellular Therapeutic"
Hubert McP. Hutton...Kansas City, Mo.

"Surgical Treatment of Periodontal Lesions"
W. B. Clotworthy.....Knoxville, Tenn.

"Teaching of Pedodontia"
Stanleigh R. Meaker.Chattanooga, Tenn.

"Operative Dentistry for Children"
O. B. Coomer.....Louisville, Ky.

"Case from Small Town Practice"
Morgan W. Boozer...Springfield, Tenn.

"A Few Original Ideas"
M. B. Carter.....Franklin, Tenn.
Rosalie Carter .....Franklin, Tenn.

"Sculpture Clinic Demonstrating Reproduction of Models, and Making of Masks"
Emmett J. Craig.....Kansas City, Mo.

"Conducting a General Practice"
F. W. Meacham.. .Chattanooga, Tenn.
H. M. A. Smith.....Knoxville, Tenn.

"Visual Education as a Factor in Dental Economics"
LeRoy S. Montague.Charleston, W. Va.

GROUP CLINIC—THE CAST GOLD INLAY

By members of the Bureau of Standards staff and dentists who have cooperated with the Bureau in a study of cast gold inlay materials and technics. (Titles and personnel will appear in the official program.)

Forest Park, Memphis.

THE MEMPHIS SESSION

RADIO PROGRAM

Tuesday, October 20, 6 p. m.

WMC, R. J. Rinehart, Kansas City, Mo.
WREC, C. T. Messner, Washington, D. C.
WHBQ, E. L. Pettibone, Cleveland, Ohio.
WNBR, Stella Risser, Houston, Texas.

Wednesday, October 21, 6 p. m.

WMC, T. A. Hardgrove, Fond du Lac, Wis.
WREC, Chalmers B. Webster, Montgomery, Ala.
WHBQ, LeRoy M. S. Miner, Boston, Mass.
WNBR, A. W. Midgley, Providence, R. I.

Thursday, October 22, 6 p. m.

WMC, C. Willard Camalier, Washington, D. C.
WREC, C. N. Johnson, Chicago, Ill.
WHBQ, Alfred Walker, New York City.
WNBR, Frank W. Delabarre, Boston, Mass.

LUNCHEON CLUB PROGRAM

Tuesday, October 20, 12:15 p. m.

Civitan Club, Peabody Hotel.
Exchange Club, Gayoso Hotel.
Lions Club, Gayoso Hotel.
Rotary Club, Gayoso Hotel.
Zonta Club, Gayoso Hotel.

Tuesday, October 20, the Quota Club will meet at 6:30 p. m. at the Peabody Hotel.

Wednesday, October 21, 12:15 p. m.

Cooperative Club, Elks Hotel.
Kiwanis Club, Claridge Hotel.

Thursday, October 22, 12:15 p. m.

Memphis Retail Credit Association, Gayoso Hotel.

Friday, October 23, 12:15 p. m.

Shrine Club, Shrine Bldg. (The Shrine Club meets every Friday at 12:15 in the Shrine Bldg. Every Shriner is invited to attend.)

SCHOOL PROGRAM

Tuesday, October 20

Central High School, 310 S. Bellevue ..... 8:30 a. m.
South Side High School, Richmond and Orleans ..... 8:30 a. m.
Humes High School, 659 N. Manassas ..... 8:30 a. m.
Messick High School, Spottswood and Greer ..... 8:30 a. m.
Tech High School, 1266 Poplar .... 8:30 a. m.
White Haven (County School) ... 9:00 a. m.
Miss Hutchinson's School (Private), 1915 Union ..... 10:50 a. m.
Lausanne (Private), 1649 Central. 10:50 a. m.

Wednesday, October 21

Booker T. Washington High School (Colored), Mississippi and Lauderdale ..... 8.30 a. m.
Manassas High School (Colored), Manassas and White ..... 8:30 a. m.
Bellevue Junior High School, Bellevue and Carr ..... 8:30 a. m.
Treadwell Junior High School, Highland ..... 8:30 a. m.
Snowden Junior High School, Parkway and McLean ..... 8:30 a. m.
Fairview Junior High School, Central and Parkway ..... 8:30 a. m.
White Station (County School) ... 9:00 a. m.
State Teachers College, Southern Ave. ..... 10:00 a. m.

Thursday, October 22

Riverside Grade School, 176 Wisconsin ..... 8:30 a. m.
Guthrie Grade School, 951 Chelsea 8:30 a. m.
Cummings Grade School, 1037 Cummings ..... 8:30 a. m.
Pope Grade School, 190 Chelsea. 8:30 a. m.
Peabody Grade School, 2086 Young 8:30 a. m.
Coleman (County School) ..... 9:00 a. m.
Germantown (County School) .... 9:00 a. m.
Bartlett (County School) ..... 9:00 a. m.
Southwestern University, N. Parkway ..... 8:30 a. m.

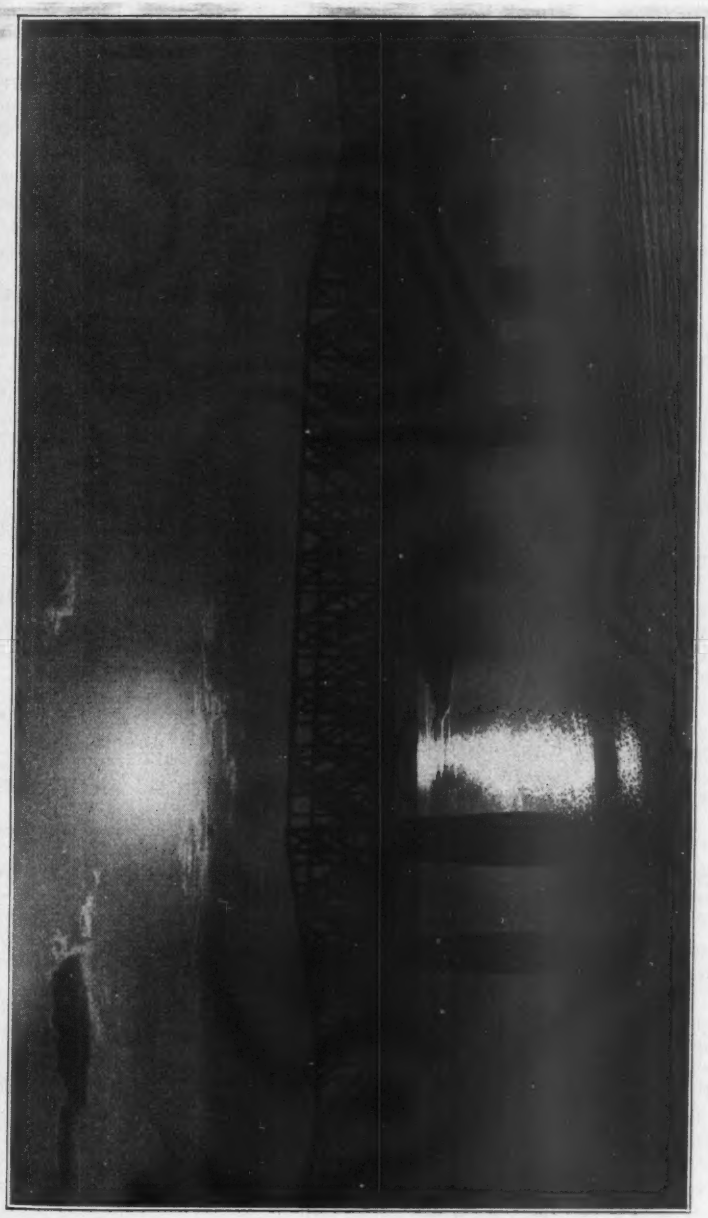
MOTION PICTURE PROGRAM

(North hallway, just off Commercial Exhibits' room)

W. E. Lundy, Chairman, Motion Pictures Memphis, Tenn.

Monday, 10 a.m. to 12 m

10:00–10:15 "Good Teeth and Good Health" University of Minnesota, Extension Division, Minneapolis, Minn.



Moonlight on the Mississippi.

10:15–10:30 "Through Life's Windows"
University of Minnesota, Extension Division, Minneapolis, Minn.

10:30–10:45 "New Ways for Old"
Metropolitan Life Insurance Co., New York City.

10:45–11:00 "Keep Smiling"
The Colgate-Palmolive-Peet Co., Chicago, Ill.

11:00–12:00 "Relation of Nutrition to Dental Health"
Castle Films, Chicago, Ill., and New York City.

2 to 5 p.m.

2:00–3:15 "The Canti Cancer Film"
American Society for Control of Cancer, New York City

3:15–3:30 "How Teeth Grow"
Eastman Teaching Films, Inc., Rochester, N. Y.

3:30–4:00 "Home Run Bill's Comeback"
The Colgate-Palmolive-Peet Co., Chicago, Ill.

4:00–4:15 "The Physiology of Mastication"
Hugh W. MacMillan, Cincinnati, Ohio

4:15–4:30 "He Who Laughs Last" (Popular Version)
New York Tuberculosis and Health Association, New York City

4:30–4:45 "Bobby's Bad Molar"
Thomas B. McCrum, Kansas City, Mo.

4:45–5:00 "Too Many Pounds"
Metropolitan Life Insurance Co., New York City

Tuesday

2 to 5 p.m.

2:00–2:30 "Lewis Cancer Film"
American Society for Control of Cancer, New York City

2:30–3:00 "This Great Peril"
American Society for Control of Cancer, New York City

3:00–4:00 "Relation of Nutrition to Dental Health"
Castle Films, Chicago, Ill., and New York City

4:00–4:15 "Sun Babies"
U. S. Department of Labor, Children's Bureau, Washington, D. C.

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Thomas B. McCrum, Kansas City, Mo.

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The Colgate-Palmolive-Peet Co., Chicago, Ill.

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Hugh W. MacMillan, Cincinnati, Ohio

11:00–11:15 "Working for Dear Life"
Metropolitan Life Insurance Co., New York City

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University of Minnesota, Extension Division, Minneapolis, Minn.

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American Society for Control of Cancer, New York City

3:15–4:15 "Relation of Nutrition to Dental Health"
Castle Films, Chicago, Ill., and New York City

4:15–4:30 "Clara Cleans Her Teeth"
Thomas B. McCrum, Kansas City, Mo.

4:30–4:45 "Posture"
U. S. Department of Labor, Children's Bureau, Washington, D. C.

4:45–5:00 "Through Life's Windows"
University of Minnesota, Extension Division, Minneapolis, Minn.

Thursday

10 a.m. to 12 m.

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American Society for Control of Cancer, New York City

3:45–4:00 "Care of the Teeth"
Thomas B. McCrum, Kansas City, Mo.

4:00–4:30 "This Great Peril"
American Society for Control of Cancer, New York City

4:30–4:45 "Posture"
U. S. Department of Labor, Children's Bureau, Washington, D. C.

4:45–5:00 "Clara Cleans Her Teeth"
Thomas B. McCrum, Kansas City, Mo.

Friday

10 a.m. to 12 m.

10:00–10:15 "How Teeth Grow"
Eastman Teaching Films, Inc., Rochester, N. Y.

10:15–10:30 "Care of the Teeth"
Eastman Teaching Films, Inc., Rochester, N. Y.

10:30–10:45 "Working for Dear Life"
Metropolitan Life Insurance Co., New York City

10:45–11:45 "Relation of Nutrition to Dental Health"
Castle Films, Chicago, Illinois, and New York City

11:45–12:00 "Sun Babies"
U. S. Department of Labor, Children's Bureau, Washington, D. C.

HEALTH EXHIBITS

1. Maryland Department of Health
   Richard Leonard, Baltimore, Md.
2. Mississippi State Board of Health
   Gladys Eyrich, Jackson, Miss.
3. Ontario Department of Health
   Fred J. Conboy, Ontario, Canada
4. New York City Department of Health, Division of Dental Service
   Harry Strusser, New York City
5. Shelby County Health Department
   L. J. McRae, Memphis, Tenn.
6. Exhibit
   A. C. Thompson, Detroit, Mich.
7. Territory of Hawaii, Department of Public Instruction
   Helen M. Baukin, Honolulu, T. H.
8. American Society for the Control of Cancer, New York City
9. American Dental Hygienists Association
10. American Dental Assistants Association
11. American Dental Association
12. New York Tuberculosis Association, New York City
13. Exhibit, B. W. Weinberger, New York City

SCIENTIFIC EXHIBITS

1. University of Louisville
   Theodore B. Beust, Louisville, Ky.
2. University of Illinois, College of Dentistry, Chicago, Ill.
3. University of Tennessee, College of Dentistry, Memphis, Tenn.
4. Baylor University, College of Dentistry, Dallas, Texas
5. Chicago College of Dental Surgery, Dental Department of Loyola University, Chicago
6. University of Iowa, College of Dentistry, Iowa City, Iowa
   C. L. Drain
7. Pathological Institute, Memphis, Tenn.
   H. C. Schmeisser, J. L. Scianni
8. United States Army, Dental Division, Washington, D. C.
9. Naval Medical School, Dental Department, Washington, D. C.
10. Miss Fairfax Proudfit, General Hospital, Memphis, Tenn.

ANNOUNCEMENTS

PAST PRESIDENTS' (A. D. A.) CLUB LUNCHEON

The Past Presidents' Club of the American Dental Association will hold its annual luncheon, Tuesday, October 20, at 12:30 p. m., at the Peabody Hotel. Percy R. Howe will be the presiding officer and the annual address will be delivered by Donald McKay Gallie.

HOMER C. BROWN, *Secretary,*
Hartman Bldg.,
Columbus, Ohio.

RESEARCH COMMISSION

The Research Commission will hold its first session at the Peabody Hotel, at 2 p. m., Sunday, October 18. All members are requested to be present.

FRANK O. HETRICK, *Chairman,*
Ottawa, Kan.

MOUTH HYGIENE LUNCHEON

The annual Mouth Hygiene Luncheon of the American Dental Association will be held Wednesday, October 21, at 12:15 p. m., in the Ballroom of the Chisca Hotel. C. N. Johnson will be the speaker. Tickets for the luncheon will be $1.25 each.

TENNESSEE STATE DENTAL ASSOCIATION LUNCHEON

A luncheon will be given to the Officers, Trustees, Delegates and Section Officers of the American Dental Association, Monday, October 19, at the Peabody Hotel, at 12:30 p. m., by the Tennessee State Dental Association.

ASSOCIATION OF AMERICAN WOMEN DENTISTS

The tenth annual meeting of the Association of American Women Dentists will be held at Hotel Peabody, October 19.

GLADYS GRIFFIS, *Sec'y-Treas.,*
First Nat. Bank Bldg.,
Paris, Texas.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS

The National Association of Dental Examiners will hold its forty-ninth annual convention at the Peabody Hotel, beginning Saturday, October 17, at 9 a. m. Each board of dental examiners is expected to participate in this meeting and many matters of national, state and interstate application are to be considered.

GEORGE L. POWERS, *Sec'y-Treas.,*
Memphis, Tenn.

ASSOCIATION OF MILITARY DENTAL SURGEONS

The annual business meeting and banquet of the Association of Military Dental Surgeons will be held, October 19-23, at the Chisca Hotel. Members are requested to register as soon as possible after arrival.

W. H. SIEFERT, *Sec'y-Treas.,*
Office of the Surgeon-General, U. S. Army,
Washington, D. C.

UNIVERSITY OF TENNESSEE COLLEGE OF DENTISTRY ALUMNI BANQUET

The alumni of the University of Tennessee College of Dentistry will hold their banquet in the Elks Hotel Ballroom, tenth floor, at 6 p. m., October 20.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

The thirteenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held at the Elks Hotel, October 16-17.

HOWARD C. MILLER, *Secretary,*
55 E. Washington St.,
Chicago, Ill.

AMERICAN ACADEMY OF PERIODONTOLOGY

The eighteenth annual meeting of the American Academy of Periodontology will convene at the Hotel Gayoso, October 15-17.

CLAYTON H. GRACEY, *Secretary,*
Fisher Bldg.,
Detroit, Mich.

AMERICAN FULL DENTURE SOCIETY

The American Full Denture Society will hold its third annual meeting, October 16-17, at the Claridge Hotel.

H. L. HARRIS, *Sec'y-Treas.,*
Medical Arts Bldg.,
Minneapolis, Minn.

AMERICAN SOCIETY FOR THE PROMOTION OF CHILDREN'S DENTISTRY

The American Society for the Promotion of Children's Dentistry will hold its annual luncheon and meeting at the Hotel Peabody, Monday, October 19, at 12:15 p. m.

CHARLES A. SWEET, *Sec'y-Treas.*,
242 Moss Ave.,
Oakland, Calif.

AMERICAN ACADEMY OF RESTORATIVE DENTISTRY

The American Academy of Restorative Dentistry will meet, October 18-19, at the Tennessee Club.

RALPH L. MORRISON, *Sec'y-Treas.*,
The La Salle,
Washington, D. C.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

The American Dental Hygienists' Association will be held at the Chisca Hotel, October 19-23.

AGNES G. MORRIS, *Secretary*,
886 Main St.,
Bridgeport, Conn.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

The American Dental Assistants Association will hold its seventh annual meeting at the Hotel Gayoso, October 19-23.

MARGARET M. HEIMBUCH, *Secretary Pro Tem*,
Rm. 803 223 W. Jackson Blvd.,
Chicago, Ill.

WOMAN'S AUXILIARY OF THE AMERICAN DENTAL ASSOCIATION

The next meeting of the Woman's Auxiliary of the American Dental Association will be held at the Peabody Hotel, October 19 at 10:30 a. m. Luncheon will be served at 1 p. m.

MRS. BRYANT K. VANN, *Secretary*,
761 Lullwater Road,
Atlanta, Ga.

TRAPSHOOTERS LEAGUE OF THE AMERICAN DENTAL ASSOCIATION

The Trapshooters League of the American Dental Association will hold its ninth annual shoot at the Memphis Gun Club, Monday, October 19, at 1 p. m.

R. P. MOSBAUGH, *Secretary*,
Oxford, Ohio.

AMERICAN DENTAL GOLF ASSOCIATION

The twelfth annual tournament of the American Dental Golf Association will be held on Monday, October 19. Class A players (handicaps 0-8) will play at the Memphis Country Club; Class B (handicap 9-16), at the Colonial Country Club, and Class C (handicap 17-24) at the Chickasaw Country Club. Headquarters will be at the Peabody Hotel. The annual Calcutta banquet will be held at the Peabody Hotel, October 18, at 7:30 p. m. Life membership in the golf association is $3. Send check to the Secretary, E. W. Browning, Boston Bldg., Salt Lake City, Utah.

PSI OMEGA FRATERNITY NATIONAL ALUMNI CHAPTER

The headquarters of the National Alumni Chapter of the Psi Omega Fraternity will be at the Claridge Hotel. The annual banquet will be held, October 19, at 6:30, at the Claridge. The executive meeting together with initiations will be held at headquarters, October 20, at 2 p. m.

J. R. MITCHELL, *Secretary*,
Candler Bldg.,
Atlanta, Ga.

DELTA SIGMA DELTA FRATERNITY

The forty-seventh annual meeting of the Supreme Chapter of Delta Sigma Delta will be held October 19, beginning at 9:30 a. m. Luncheon will be followed by a business meeting and initiatory exercises. The annual banquet will be held at Hotel Gayoso, headquarters, at 6 p. m. Present membership card when registering for banquet. If planning to attend, address Brother Justin D. Towner, Exchange Bldg., Memphis, Tenn.

By Order of the Supreme Council.

XI PSI PHI FRATERNITY

The Supreme Chapter of Xi Psi Phi Fraternity will hold its biennial meeting, October 16-17, at the Elks Hotel, beginning October

16, at 9 a. m. The banquet will be held at the Elks Hotel, October 19 at 6:30 p. m.

G. A. GRUBB, *Supreme President,*
Lincoln, Nebr.

ALPHA OMEGA FRATERNITY

A meeting of the Supreme Council has been called by the order of the Supreme Chancellor, Monday, October 19, at 2 p. m., at the Hotel Chisca, fraternity headquarters. All fraters are requested to attend this meeting. The chairman of local arrangements is M. H. Davis, Hotel Peabody, Memphis.

A. M. Flaschner, *Supreme Scribe,*
419 Boylston St.,
Boston, Mass.

Riverside Park, Memphis.

Hotel Peabody Lounge.

RAILROAD RATES TO MEMPHIS, TENN.

The American Dental Association has discontinued the use of the Identification Convention Certificate, and again this year is using the "Certificate Plan." The certificates will be obtainable from your railroad agent, and NOT THROUGH THIS OFFICE. Following is full information regarding the plan, and giving dates of sale of tickets in all sections of the United States.

The following directions are submitted for your guidance:

1. Be sure that when purchasing going ticket you request a CERTIFICATE. *Do not make the mistake of asking for a "Receipt."*

2. Present yourself at the railroad station for tickets and Certificates at least 30 minutes before departure of train on which you will begin your journey.

3. *Certificates are not kept at all stations.* If you inquire at your home station, you can ascertain whether Certificates and through tickets can be obtained to place of meeting. If not obtainable at your home station, the agent will inform you at what station they can be obtained. You can in such case purchase a local ticket to the station which has Certificates in stock, where you can purchase a through ticket and at the same time ask for and obtain a Certificate to place of meeting.

4. *Immediately on your arrival at the meeting present your Certificate* to the endorsing officer, Dr. Max Giesecke, Vice-President, as the reduced fares for the return journey will not apply unless you are properly identified as provided for by the Certificates.

5. *It has been arranged that the Special Agent of the Carriers will be in attendance on October 19 to 23 from 8:30 a. m. to 5:30 p. m., to validate Certificates.* If you arrive at the meeting and leave for home again prior to the Special Agent's arrival, or if you arrive at the meeting later than October 23, after the Special Agent has left, you cannot have your Certificate validated and consequently you will not obtain the benefit of the reduction on the home journey.

6. Certificates issued to children at half fares will be counted the same as Certificates held by adults.

7. If your Certificate is duly validated, you will be entitled up to and including October 27 to a return ticket via the same route over which you made the going journey *at one-half of the regular one-way tariff fare* from the place of meeting to the point at which your Certificate was issued. *(The identical route must be used in both going and returning in order to benefit under the Certificate plan.)*

8. Return tickets issued at the reduced fares will not be good on any limited train on which such reduced fare transportation is not honored.

9. *No refund of fare will be made on account of failure to obtain proper Certificate when purchasing going tickets, nor on account of failure to present validated Certificate when purchasing return ticket.*

A program of exceptional merit has been arranged, and we extend to you a cordial invitation to be present.

Transportation Committee

O. J. SPECKER,
R. L. SPRAU,
HARRY W. NELSON,
W. F. NORTHRUP,
H. B. PINNEY, *Chairman,*
212 East Superior Street, Chicago, Ill.

TRUNK LINE ASSOCIATION

Sale dates for New York State (east of Buffalo and Salamanca), New Jersey, Pennsylvania (east of Erie, Oil City and Pittsburgh), Delaware, Maryland, District of Columbia, Virginia and West Virginia (east of Wheeling, Parkersburg, Kenova).....Oct. 13-19, Incl.
Final honoring date.....Oct. 27, 1931

TRANS-CONTINENTAL PASSENGER ASSOCIATION
WESTERN PASSENGER ASSOCIATION

Sale dates for Colorado (Julesburg only), Illinois, Iowa, Kansas, Manitoba (see note), Minnesota, Missouri, Nebraska, Northern Michigan, North Dakota, South Dakota, Wisconsin.....Oct. 13-19, Incl.
Colorado (except Julesburg), New Mexico, Wyoming.....Oct. 12-18, Incl.
Arizona, British Columbia, Idaho, Montana, Nevada, Utah, Oregon (except via California), Washington.....Oct. 11-17, Incl.
California .....Oct. 10-17, Incl.
Oregon (via California) .....Oct. 9-16, Incl.

NOTE—Manitoba (on Great Nor., Nor. Pac. and M., St. P. & S. S. M. Rys., also from Winnipeg via Can. Nat'l and Can. Pac. Rys.)

Final honoring date.....Oct. 27, 1931

SOUTHEASTERN PASSENGER ASSOCIATION

Sale dates for points in territory (south of the Ohio and Potomac and east of the Mississippi Rivers) .....Oct. 13-19, Incl.
Final honoring date .....Oct. 27, 1931

NEW ENGLAND PASSENGER ASSOCIATION

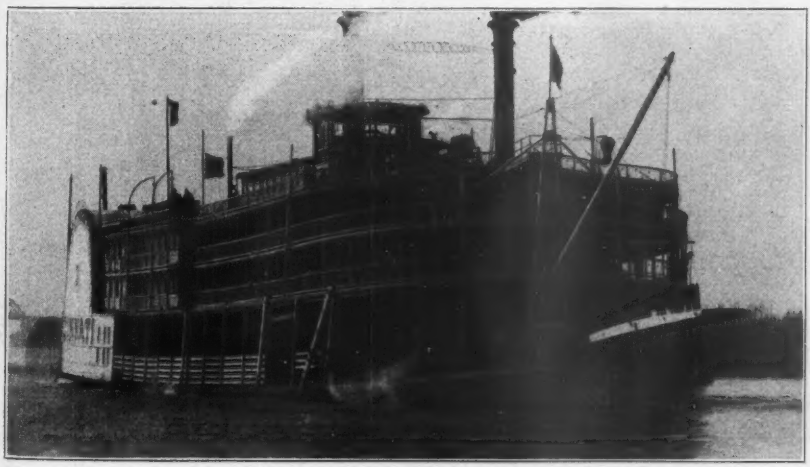
Sale dates for points in territory (New England).....Oct. 13-19, Incl.
Final honoring date .....Oct. 27, 1931

SOUTHWESTERN PASSENGER ASSOCIATION

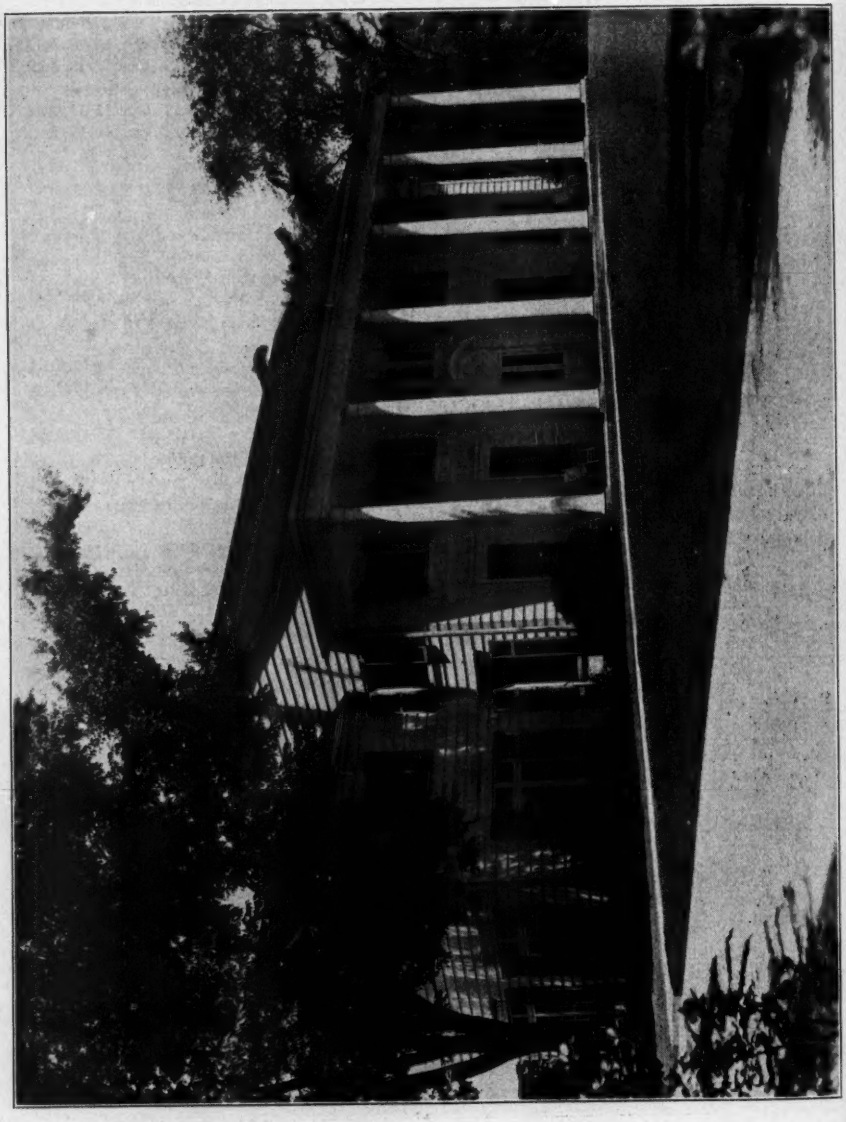
Sale dates for Oklahoma, Texas.....Oct. 12-18, Incl.
Arkansas, Kansas, Louisiana, Missouri, Memphis, Tennessee, and Natchez, Miss. .....Oct. 13-19, Incl.
Final honoring date .....Oct. 27, 1931

CENTRAL PASSENGER ASSOCIATION

Sale dates for points in territory (west of Buffalo, Niagara Falls, Salamanca, Pittsburgh, Wheeling, Parkersburg, and Kenova to and including Chicago and St. Louis, and north of the Ohio River, including Cincinnati, Louisville and Cairo) .....Oct. 13-19, Incl.
Final honoring date .....Oct. 27, 1931



Steamboat on the Mississippi.



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Abbott Laboratories, 14th St. and Sheridan Rd., North Chicago, Ill.

Aderer, Inc., Julius, 115 W. 45th St., New York City.

American Hecolite Denture Corp., 94 E. 6th St., Portland, Ore.

Barkmeyer Electrical Laboratory, Inc., The, 549 W. Washington Blvd., Chicago, Ill.

Bard-Parker Company, Inc., 369 Lexington Ave., New York City.

Berry Dental Laboratory Company, The, 409 N. 11th St., St. Louis, Mo.

Boos, Henry P., 808 Nicollet Ave., Minneapolis, Minn.

Butler, John O., Company, 7359 Cottage Grove Ave., Chicago, Ill.

Cameron's Surgical Specialty Co., 666 West Division St., Chicago, Ill.

Chicago X-Ray Film and Mount Co., 2532 Irving Park Blvd., Chicago, Ill.

Church and Dwight Company, Inc., 27 Cedar St., New York City.

Colgate-Palmolive-Peet Company, Palmolive Bldg., Chicago, Ill.

Corega Chemical Company, 208 St. Clair Ave., N. W., Cleveland, Ohio.

Corning Rubber Company, Inc., 266-270 Pearl Street, Brooklyn, N. Y.

Crescent Dental Mfg. Co., 1832 S. Crawford Ave., Chicago, Ill.

Davis, R. B., Company, Hoboken, N. J.

De Vilbiss Company, The, 300 Phillips Ave., Toledo, Ohio.

Drucker, August E., Co., 2226 Bush St., San Francisco, Calif.

Eastman Kodak Company, 341 State St., Rochester, N. Y.

Enamodent Laboratories, Inc., The, 420 E. Washington St., Portland, Ore.

Friedman Specialty Co., 25 East Washington St., Chicago, Ill.

Goldsmith Brothers Smelting and Refining Co., 29 E. Madison St., Chicago, Ill.

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Hanovia Chemical and Mfg. Co., Chestnut St. & N. J. R. R. Ave., Newark, N. J.

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Hu-Friedy Manufacturing Co., 3118 N. Rockwell St., Chicago, Ill.

Interstate Dental Company, Inc., 41 Union Square, New York City.

Lavoris Chemical Company, 918 Third St., Minneapolis, Minn.

Lochhead Laboratories, Inc., 115 W. 45th St., New York City.

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Alternate

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John E. Gurley, 350 Post Street, San Francisco
Howard Dunn, 450 Sutter Street, San Francisco
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Lester A. High, 1624 Franklin Street, Oakland
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Perce P. Yohe, 5212 Wilshire Blvd., Los Angeles

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W. S. P. Combs, Middletown

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Mark F. Finley, 1928 I St.. N. W., Washington

Alternates

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Charles D. Cole, 1835 I St., N. W., Washington

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Alternates

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R. W. McNulty, 386 S. Kenilworth Ave., Elmhurst
F. A. Stewart, Girard
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Ralph E. Libberton, 7359 Cottage Grove Ave., Chicago
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H. J. Altfillisch, Roshek Bldg., Dubuque
John Scholten, Dows Bldg., Cedar Rapids
A. W. Bryan, Iowa City

Alternates

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W. J. Charters, Hippee Bldg., Des Moines
C. E. Woodbury, Council Bluffs
L. M. Fitzgerald, Roshek Bldg., Dubuque
C. S. Foster, Dows Bldg., Cedar Rapids
J. E. Forney, Keokuk

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Homer R. Robison, Hutchinson
F. A. Richmond, Federal Reserve Life Bldg., Kansas City
A. J. Buff, Mills Bldg., Topeka

Alternates

H. Claude Holmes, 425 S. Vine St., Wichita
J. B. Stevens, Hutchinson
C. P. Elder, Simpson Bldg., Atchison
T. M. Robertson, Coffeyville

KENTUCKY

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E. C. Hume, Heyburn Bldg., Louisville
J. T. O'Rourke, 129 E. Broadway, Louisville
W. F. Walz, Fayette Bk. Bldg., Lexington

Alternates

C. S. Pearcy, Starks Bldg., Louisville
R. P. Thomas, Heyburn Bldg., Louisville
C. W. Meguiar, Franklin

LOUISIANA

Delegates

R. L. Wood, 408 Bernhardt Bldg., Monroe
J. P. Wahl, 1135 Maison Blanche, New Orleans

Alternates

F. J. Wolfe, 835 Maison Blanche, New Orleans
S. L. Tiblier, 922 Canal Bank Bldg., New Orleans

MAINE

Delegates

F. E. Maxfield, Bangor
F. S. Woods, Portland

Alternates

Henry A. Kelley, Trelawny Bldg., Portland
Stanley M. Gower, Skowhegan

MARYLAND

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G. M. Anderson, 831 Park Ave., Baltimore
J. S. Hopkins, Belair
J. Ben Robinson, Medical Arts Bldg., Baltimore

Alternates

H. H. Streett, 819 Park Ave., Baltimore
T. S. Eader, Frederick
W. D. Day, Medical Arts Bldg., Baltimore

MASSACHUSETTS

Delegates

William H. Gilpatric, 358 Commonwealth Ave., Boston
Walter J. Bryans, 106 Main St., Lee
Frank H. Dean, 311 Main St., Worcester
Philip E. Adams, 236 Newbury St., Boston
Amos I. Hadley, 125 Marlborough St., Boston
Harold W. Alden, 160 Main St., Northampton
David P. Spinney, 1330 Beacon St., Brookline
Cedric F. Harring, 1330 Beacon St., Brookline
Frederick G. Allen, 358 Commonwealth Ave., Boston

Alternates

Leroy M. S. Miner, 363 Marlborough St., Boston
William Rice, 416 Huntington Ave., Boston
Arthur T. Palmer, 51 Broad St., Lynn
Fred G. Rollins, 358 Commonwealth Ave., Boston
J. Edward Cheney, 717 Main St., Fitchburg
Frank P. Simpson, 18 Bank Row, Pittsfield
Leon A. Storz, Park Bldg., Worcester
Charles W. Hammett, 2½ Main St., Taunton
Henry H. Piper, 411 High St., West Medford

MICHIGAN

Delegates

R. E. Patterson, Stroh Bldg., Detroit
Ward Moore, Grand Rapids Nat. Bk. Bldg., Grand Rapids
M. W. Prince, 7634 Dexter Blvd., Detroit
E. G. Robbins, Robbins Block, Ishpeming
U. G. Rickert, 726 S. State St., Ann Arbor
W. F. Northrup, Stroh Bldg., Detroit
M. L. Ward, Ann Arbor

Alternates

R. J. von Tick, Stroh Bldg., Detroit
C. J. Lyons, 1004 Oakland Ave., Ann Arbor
W. W. Gibson, Medical Arts Bldg., Grand Rapids
J. O. Goodsell, 2nd Nat. Bk. Bldg., Saginaw
W. R. Davis, Michigan Dept. of Health, Lansing
H. F. Parks, Reynolds Bldg., Jackson
M. E. Page, 303 W. Western Ave., Muskegon

MINNESOTA

Delegates

Benjamin Sandy, Medical Arts Bldg., Minneapolis
T. B. Hartzell, Physicians and Surgeons Bldg., Minneapolis
V. D. Irwin, Fidelity Bldg., Duluth
I. A. Epstein, Lowry Bldg., St. Paul
Clayton A. Swanson, 1009 Nicollet Ave., Minneapolis
William J. von Blank, New Ulm
Max E. Ernst, Lowry Bldg., St. Paul
Harold L. Harris, Hamm Bldg., St. Paul

Alternates

Carl O. Flagstad, Medical Arts Bldg., Minneapolis
E. E. McGibbon, Medical Arts Bldg., Minneapolis
Boyd S. Gardner, Rochester
H. B. Clark, Lowry Bldg., St. Paul
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CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Asymmetry of the Head and Face in Infants and in Children: David Greene (*Am. J. Dis. Child.*, June, 1931) discusses asymmetry of the face and head in infants that had shown no asymmetry at birth, first noted in his earliest cases at about the eighth week. As a result of the recumbent position, asymmetry of the cranium developed and later accompanying asymmetry of the face, which involved the bony and the soft tissues. A flat area was formed on the part of the head that rested on the mattress or pillow, and this flattening became accentuated until the head and face were misshapen and even greatly deformed. The deformity presented certain characteristics: 1. A flattening of the occipital region with a corresponding bulging of the frontal region of the same side. 2. Prominence of one cheek involving chiefly the malar bone, while the opposite cheek appeared flattened. 3. A disparity in the level of the ears. On the flattened side, the ear was moved farther forward and flared more than the one on the opposite side. 4. A deviation of the nose toward the flat side. To treat the deformity, the posture was changed and in the older infants a sand bag was used to keep the head from turning back to the flat side, or a cap was put on and the strings tied to the lattices of the crib. The infants' preference for facing the light and the occupants of the room was utilized in changing their position. The results obtained within a few weeks were in all cases encouraging. The degree of asymmetry increased in the infants who were allowed to maintain their accustomed sleeping position. The author states that the effect of the sleeping posture in early life on the shape of the head is greater than is generally recognized. He cites the results among native Filipinos and Indian tribes of the practices of sleeping on hard surfaces. In a midwifery clinic in Stuttgart, Wacher succeeded in correcting asymmetry by placing infants in corrective postures. In a small group which it was possible to check after seventeen to nineteen years, the change induced was found to persist. The author believes that asymmetry is the result of a lack of rigidity in the bones (from osteoporosis) and constant pressure, although it may result from rickets. Pressure on the skull causes increase in height of the cheek bones and difference in level of the ears. In these cases, there was sometimes an irregularity of the dental arches and a lateral deviation of the nose.

Treatment of Vincent's Infection and Stomatitis: Seven cases of Vincent's infection are reported by Harold A. Rosenbaum (*Illinois M. J.*, May, 1931) in children ranging in age from 1½ years to 8 years. All were treated with stovarsol, with good results. In cases with fever, its use was followed by fall in temperature to normal within twenty-four hours and relief from pain. The children ate again without being forced to do so. Subjective improvement in some cases preceded objective improvement. The use of stovarsol in adult cases is suggested.

Abuse of Narcotics: The abuse of narcotics is discussed by Bernard Fantus (*J. A. M. A.*, May 16, 1931), who defines narcotics as agents that lessen the relation of the central nervous system to external as well as internal conditions of the body, "freeing the mind from the thraldom of the senses." Narcotics are an ever-present temptation to patient and physician because of the ease and ignorance with which symptoms may be overcome. By their use, a diagnostically indispensable symptom may be submerged. In appendicitis, if the pain is masked by a narcotic, the appendix may go on to perforation, with death ensuing. While, as has been said, it should not be necessary to make the diagnosis at the expense of exhausting pain, when symptoms are removed by the administration of a narcotic, the physician must assume the responsibility of interpreting other guiding phe-

nomena, such as temperature, pulse and white cell count. The use of narcotics may lead to neglect of the really vital means of treatment. The use of so-called fever narcotics and of stupefying agents such as liquor in febrile colds, enabling the patient to keep up when he should be in bed, leads to all sorts of complications, such as sinus disease, pneumonia, rheumatism and nephritis. Druggists recommend acetylsalicylic acid, acetphenetidin or amidopyrin to overcome the aches and pains of a febrile cold, and a minor ailment may be converted into a serious illness. When micro-organisms of disease invade the body to the extent of producing fever, a struggle for supremacy is on between man and microbe. If the fever and its symptoms are suppressed, the microbes invade triumphantly and disastrously. Nothing is easier than to remove the results of fatigue—headache, backache, nervous irritability and insomnia—by narcotics. A rest cure is needed, not drugs. Bromid, which is not a narcotic in the sense in which the term is here used, may be of value in such cases by lessening the reactivity of the nervous system. One of the barbitals may be used to break in on the vicious circle produced by sleeplessness, but must be employed in conjunction with a rest cure, not instead of it. Pain indicates rest. Narcotics, by interfering with the rest that pain would force on us, thwart the natural processes of repair. If a narcotic is prescribed, the underlying pathologic condition must always be taken care of. A useful reaction of the body to disease must never be abolished by narcotics. Formation of habit should be the ever-present specter to inspire fear of prescribing narcotics in chronic or recurring ailments, unless there are malignant conditions or limited tenure of life. Especially should physicians, dentists, nurses and pharmacists make it their inviolable rule never to prescribe narcotics for themselves; for from among these classes is recruited a large contingent of those who become afflicted with the habitual use of narcotics.

Trigeminal Neuralgia and Its Treatment: Harris (*Lancet,* March 14, 1931; abstr. *J. A. M. A.*) states that, in slight cases, medicinal treatment by gelsemium and the milder analgesics, with radiant heat or ionization locally and complete rest for a time, may give relief, but in severe neuralgic cases all such methods of treatment are altogether vain. Nothing then suffices except nerve blocking, either by alcohol injection or resection of the nerve. Section of peripheral branches is doomed to failure, and the only open operation that should be undertaken is resection of the posterior sensory root. Alcohol injection of the peripheral foramina, the infra-orbital or mental, is occasionally successful but often fails to relieve for more than a few days. To make certain of success, the nerve trunks must be injected at their deep foramina of exit from the skull, or else the ganglion be injected, a much more difficult and delicate proceeding. During the last twenty-three years, the author has treated by injection over 1,100 patients with trigeminal neuralgia and is convinced that one should never fail to inject the nerve at the foramen ovale or rotundem and thus relieve the pain for at least a year, and often for much longer. Injections of the ganglion may produce light anesthesia only, or total loss of all sensation. This will not vary after a few days have elapsed since the injection; and, in large numbers of his cases, he does not doubt that the cure is permanent. Cases in which the neuralgia has returned after injection of a nerve trunk, especially if slight anesthesia persists, are often more difficult to inject than a fresh case, and for this reason he advises injection of the ganglion when possible, if the neuralgia returns within eighteen months of the first injection. If repeated injections in the region of the foramen ovale are performed, considerable fibrosis of the tissues in the zygomatic fossa results, with consequent greatly increased difficulty in manipulation of the needle, and ultimately it may even become necessary to resort to surgical operation to resect the posterior root within the cranium.

Case of Black Tongue: Wharry (*Brit. M. J.,* April 18, 1931; abstr. *J. A. M. A.*) reports a case of black tongue which shows that this condition may spread over the posterior third of the tongue and is not confined to localized patches anterior to the circumvallate papillae. The dark color is caused by the fungus *Cryptococcus linguae-pilosae* and not necessarily by any changes in the papillae of the tongue itself. The disease may be of long standing and yet not cause hypertrophy of the filiform papillae, either filiform or circumvallate. The hypertrophy of the filiform papillae, so often noticed before, is probably due to continuous irritation of the tongue at one particular spot where the fungus has taken a firm hold. The growth of the fungus is the primary condi-

tion and may exist without lingual hypertrophy.

Essentials of an Approved Department of Radiology or Roentgenology: 1. Definitions. *Radiology.*—The branch of medicine which deals with the diagnostic and therapeutic application of radiant energy, including roentgen rays, radium, ultraviolet rays and other spectral radiation. *Department of Radiology.*—The department of a hospital clinic or other institution, organized and equipped for the diagnostic and therapeutic application of radiant energy, including roentgen rays, radium, ultraviolet rays and other spectral radiations. *Radiologist.*—A qualified physician who also has obtained adequate special training and experience in general radiology. *Roentgenology.*—The phase of radiology which deals with the diagnostic and therapeutic application of roentgen rays only. *Department of Roentgenology.*—The department of a hospital, clinic or other institution organized and equipped for the diagnostic and therapeutic application of roentgen rays only. A department organized and equipped solely for the diagnostic or therapeutic application of roentgen rays shall be known as a department of diagnostic or therapeutic roentgenology, respectively. *Roentgenologist.*—A qualified physician who has had adequate training and experience in the diagnostic and therapeutic application of roentgen rays. *Diagnositc Roentgenologist.*—A roentgenologist who limits his practice to the diagnostic phase of roentgenology. *Therapeutic Roentgenologist.*—A roentgenologist who limits his practice to the therapeutic phase of roentgenology. *Radium Specialist.*—A radiologist who specializes in the therapeutic use of radium. . . . 11. Admission to the Approved List. Only those departments of radiology or roentgenology in which the personnel, space, equipment, management, finances and records are such as will insure honest, efficient and accurate work may expect to be listed as approved. Any department of radiology or roentgenology desiring to be placed on the approved list should apply to the Council on Medical Education and Hospitals of the American Medical Association, 535 North Dearborn St., Chicago.—*J. A. M. A.*, May 22, 1931.

Agranulocytic Angina: According to S. Kahlstrom (*California and West. Med.*, April, 1931), who reports a case of agranulocytic angina, the condition is of unknown etiology and pathogenesis. The demonstration of bacteria in the blood is not proof of an infectious nature of the disease, as bacteria are also frequently found in late stages of leukemia, and their presence is due to invasion of the body throughout areas of necrosis. There is marked predominance in the female sex (3.8 to 1). Ulceronecrotic lesions, usually most marked on the buccopharyngeal mucosa, without the common mechanisms of defense surrounding them, are present. There is an absence of appreciable tumefaction or metaplasia of hematopoietic organs, but a hyperplasia of the reticulo-endothelial system. There is marked leukopenia with considerable diminution or disappearance of granular white cells, with absence of important modifications in number and quality of red cells and platelets. Alteration in the bone marrow is characterized essentially by disappearance of granular cells. The disease is attended by hyperpyrexia, marked prostration and commonly an early fatal termination. Essential agranulogytic angina can usually be differentiated by its clinical and pathologic symptoms from diseases showing a secondary agranulocytic complex. The one form of treatment under which most patients have recovered is irradiation of the long bones, as used by Friedmann. The case reported was that of a miner, aged 70, a man well nourished and exceptionally vigorous for his age. He entered the hospital for treatment of burns of the feet sustained three months previously while working barefooted in hot desert sand. His only previous illness was typhoid fever. His habits were moderate. The teeth were in a poor state of repair and mouth hygiene was poor. The agranulocytic angina developed on the forty-seventh day in the hospital, death ensuing in eight days. The author comments: "This case is unique in that it occurred during hospitalization for another ailment, only four similar cases having been reported previously. With one exception, this patient was the oldest of any reported cases afflicted with agranulocytic angina. It is further interesting to note that upon entrance to the hospital the patient possessed a normal mechanism of response to infection, carrying a leukocytosis of 24,000 with a normal percentage of granular cells, thus disproving one theory that agranulocytic angina is due to congenital hypoplasia of the bone marrow with consequent inability to ward off infection."

Roentgen Treatment of Agranulocytosis: The number of cases of agranulocytosis reported in the literature is now sufficiently large to justify a first attempt at a statistical evaluation of the various methods of treatment. Only three methods are of importance: (*a*) intravenous injections of small doses of neo-arsphenamin, (*b*) blood transfusions and (*c*) the irradiation of the long bones with the roentgen rays. An analysis of 340 cases showed a total mortality of 79 per cent. For the purpose of evaluating therapeutic procedures, cases in patients who died within forty-eight hours of beginning treatment were discarded. This leaves eighty patients treated by means of irradiation of the long bones with a mortality of 53 per cent; forty-nine patients treated by means of transfusion, with a mortality of 69 per cent; thirty-one who received neo-arsphenamin, with a mortality of 77 per cent; while of 172 patients who received other methods of treatment, 75 per cent died. It would appear, then, that only irradiation and transfusion promise even reasonably satisfactory results. It will probably be wise to use both methods in the treatment of a severe case and doubtless the results will be better the earlier these methods are applied. During the last twelve months, seven cases of agranulocytosis were seen at the Jewish Hospital of St. Louis. Of these patients, two were moribund when admitted and died the same day; a third received only symptomatic treatment and also died. The remaining four were given stimulating doses of roentgen rays over the long bones. Of these, two recovered, responding rapidly to the treatment, and were discharged clinically well. The other two also responded promptly and satisfactorily to roentgen treatment, the blood picture becoming normal and the fever and angina subsiding; but after an interval of well being, both patients relapsed and in this relapse were refractory to the roentgen rays. Both died in coma.—Albert E. Taussig, in *J. A. M. A.*, June 20, 1931.

Agranulocytic Angina.—Though well recognized as a separate entity in Germany and America, there is little about this disease in the literature of this country. Thus an account of a case described by Dr. Garrod and Mr. Hervey Williams in the *Lancet* is particularly interesting. The main features of the disease are an extreme leukopenia, in which the granular leukocytes are chiefly affected, and extensive superficial necrosis of the mucous membrane of the mouth and pharynx. In the case described, the patient was an active married woman of 50, who became suddenly ill with lassitude, sore throat and moderate fever. The sore throat increased, and in forty-eight hours a few small white oval patches appeared on the soft palate. By the next day, these white patches had increased in area and numbers, and now extended forward to the hard palate and buccal mucous membrane, and also backward to the pharynx. Bacteriologic examination showed numerous streptococci of various kinds, a fair number of yeasts similar to the organisms of thrush, no *B. diphtheriae,* and no Vincent's organisms. In spite of energetic treatment the condition steadily progressed, and the patient died thirteen days after the onset of symptoms. The blood-count showed 2,000 white cells per c.mm., with a very great diminution in percentage of polymorphonuclears. Blood cultures gave no growth after four days' incubation. It was noticed that the blood took more than an hour to clot. The authors point out that this was a typical case of agranulocytic angina, with the characteristic features of that disease. The blood-count was characteristic, as were also the age and sex of the patient, the nature and extent of the oral lesions, the absence of specific bacterial infection, the failure of all forms of treatment, and the steady progress to a fatal termination. Though no definite information as regards etiology was obtainable in this case, the authors regard the bone marrow as the primary site of the disease. The reduction in numbers of polymorphonuclear leukocytes would in itself account for the lack of resistance in the tissues, and consequent lesions of the mucous membrane. The long coagulation time is of interest, and has been noted also in other cases of this disease. As a matter of fact, the coagulation time is inclined to be increased in all blood conditions, in leukocytosis and leukopenia, in anemia and polycythemia, so that this again is more or less to be expected in this condition.—Abstr. *Dent. Surgeon,* March 28, 1931.

Agranulocytosis.—Dameshek and Ingall (*Am. J. M. Sc.,* April 1931; abstr. *J. A. M. A.*) report nine cases diagnosed as agranulocytosis (malignant neutropenia). Four of the cases were typical of the "angina agranulocytica" described by Schultz, the other five being atypical in one or another feature. Two of the cases were in infants. Two of the

patients recovered. In one case, arsphenamin injections constituted in all probability an etiologic factor. The diagnosis of the disease, its blood picture and various clinical features are discussed. The recovery phase, with its marked monocytosis and histiocytosis, was studied in two cases. It is felt that agranulocytosis is a symptom complex dependent primarily on an abnormal reaction of the bone marrow to severe sepsis. Gradations can be seen between the typical case with angina and those cases of sepsis with an atypical leukopenia.

Management of Fractures Involving the Paranasal Sinuses: The management of fractures involving the paranasal sinuses is similar to the surgical procedures followed in radical sinus surgery. In fact, the most common complication of these fractures is sinusitis. The rhinologist is best prepared to handle these fractures, and, by obtaining good results, he can convince the general surgeon that these cases belong to his specialty. Today, an increasing proportion of hospital emergency cases are head injuries, the results of accidents during rapid transportation, industrial injuries and those obtained from bodily violence. The majority of the fractures of the facial bones exclusive of the simple nasal bone fractures, extend into the maxillary, frontal or ethmoidal sinus. The sinus involved fills with blood, which readily becomes infected. The basis of treatment is the replacement of the bony fragments, and the drainage of the sinus entered. This will restore the features.—John J. Shea, in *J. A. M. A.*, Feb. 7, 1931.

Hotel Peabody Main Dining Room

MISCELLANY

REPORT OF THE COMMITTEE ON STANDARDS AND SERVICES TO THE COMMITTEE ON COMMUNITY DENTAL SERVICE OF THE NEW YORK TUBERCULOSIS AND HEALTH ASSOCIATION

The following resolution in regard to dental care for children in institutions and foster homes has been passed by the Committee on Community Dental Service of the New York Tuberculosis and Health Association. A similar resolution, introduced by a member of this committee, with the insertion of the word "many" to define child caring agencies, in the first line, was passed by the Dental Society of the State of New York at its annual meeting.

WHEREAS, child caring agencies have no definite policy concerning care of children's teeth, and

WHEREAS, many thousands of children throughout the United States are under the care of such agencies, and

WHEREAS, an opportunity is presented for promoting better health through preventive dentistry particularly among the youngest children where the greatest good can be accomplished; be it

Resolved, that the Committee on Community Dental Service urge all organizations caring for children either in institutions or in foster homes to adopt a minimum standard of dental care such as the one outlined in the "Standard Procedure for Treatment of Dental Clinic Patients" worked out by the Associated Out-Patient Clinics Committee of the New York Tuberculosis and Health Association and also to adopt the following policy:

DENTAL CARE FOR CHILDREN IN INSTITUTIONS AND FOSTER HOMES

Dental care should be provided for all children between the ages of 2 and 14, especially the youngest children (preschool group) because of the (1) benefit to health, (2) preservation of teeth in position in order to maintain ability to chew effectively and painlessly, (3) preservation of the dental arch and (4) minimum expense.

The normal growth of the jaws is disturbed by premature loss of the deciduous (first or baby) teeth, which tends to cause crowding of the permanent teeth and deformity of the adjacent bones of the nose and head.

Not only from the standpoint of health but also from the standpoint of economy, the filling of tiny pits, fissures and cavities saves the deciduous teeth, thereby allowing the jaw to develop normally and possibly obviate the later expense of orthodontia and nasal operations.

The filling of the tiny breaks in the enamel of the first permanent teeth (especially first permanent molars) to erupt is also of advantage economically because of the time and cost necessary to take care of the extensive caries in the child of school age.

The necessary dental care may be obtained by service: (1) provided by the organization in the institutional building or administrative headquarters; (2) in private offices of dentists, the fee being paid by the institution, and (3) in public clinics.

INFECTION FOLLOWING EXTRACTION OF A TOOTH

The defendant, a licensed dentist, extracted the plaintiff's left lower first molar tooth, after injecting procain hydrochlorid (novocain) into the gum. After the extraction, a pus pocket was found on the distal root of the tooth. The patient bled profusely, and after a few days of ineffectual attempts to control the hemorrhage, the dentist-defendant referred his patient to a physician. The physician, ten days after the tooth had been extracted, found a large abscess on the lower left jaw, the place where the hypodermic needle had been inserted into the gum being the primary point of infection. The patient lost seven lower teeth and a portion of his lower jawbone. A necessary operation left an unsightly scar on his face. The patient sued and obtained a verdict. The dentist-defendant appealed to the District Court of Appeal, Third District, California.

The complaint was based on two charges: 1. That the defendant was negligent in extracting the tooth and thereafter in treating and caring for the wound. 2. That the defendant was negligent in the use of the hypodermic needle in establishing local anesthesia.

The case was tried on the theory that it is a part of a dentist's professional duty to treat the bruised and bleeding socket from which a tooth has been removed. Said the appellate court:

"This case was tried on the theory that it is a part of a dentist's professional duty to treat the bruised and bleeding socket from which a tooth has been removed. It is only common knowledge to declare this is a necessary part of the professional operation of extracting a tooth. If the dentist fails to use ordinary precaution in subsequently protecting the bruised and sensitive socket against infection from foreign matter, or fails to use reasonable care to stop unusual and profuse bleeding from the socket as the result of extracting the tooth, he will be guilty of negligence in the operation. These incidents to the operation of extracting a tooth are just as essential as sterilizing the parts and sewing up the abdominal incision after performing an operation for appendicitis. The restoring of a healthy condition to the parts which are injured in the performance of an operation is just as necessary as the removal of the diseased portion. Both proceedings are necessary parts of the same professional operation. A failure to reasonably sterilize and treat the socket from which a tooth has been removed, to prevent infection, will ordinarily render a dentist liable for malpractice if the omission results in injury to the patient."

The court concluded, however, that the evidence in the case showed that the socket from which the tooth had been extracted was not the origin of the infection and that the dentist therefore was not negligent in his postoperative treatment of the empty socket.

The dentist-defendant asserted that the evidence was not sufficient to establish negligence on his part, in connection with the administration of the local anesthetic, because there was no direct testimony that either the needle or the solution which was used in administering the anesthetic was not sterile. There is, said the appellate court, a remote possibility that the infection developed from some cause other than the defendant's failure to sterilize the needle or the gum. The evidence was sufficient, however, continued the court, to warrant the jury in finding that the infection was caused by the dentist's neglect to follow reasonable precautions, notwithstanding his testimony to the contrary. Because of the very subtleness of the origin and development of disease, less certainty is required in proof thereof. It is not necessary in the trial of civil cases that the circumstances shall establish the negligence of the defendant as the proximate cause of the injury with such absolute certainty as to exclude every other conclusion. It is sufficient if there is substantial evidence reasonable to support the judgment.

Cases that depend on knowledge of the scientific effect of medicine or the result of surgery must ordinarily be established by the expert testimony of physicians. This rule, however, applies only to such facts as are peculiarly within the knowledge of such professional experts, and not to such facts as may be ascertained by the ordinary use of the senses of a nonexpert. It was not necessary, therefore, for any dentist or physician to state that the conduct of the dentist was negligent or in conflict with the usual established practice of the profession in that vicinity, to administer a local anesthetic for the purpose of extracting a tooth without sterilizing the needle or the flesh into which it was inserted. The court will take judicial notice of the necessity to use ordinary care to procure sterilization under such circumstances. The case was tried on the theory that every one concerned recognized that duty.

The instruction of the trial court was erroneous, however, which told the jury that if it believed from the evidence that the defendant used or employed either a hypodermic needle or a solution that was not sterile, in injecting the anesthetic into the plaintiff's gum, and if he thereby proximately caused the infection, the plaintiff was entitled to recover damages. The instruction made no reference to negligence. It based the liability of the dentist-defendant solely and absolutely on his use of an unsterile needle or solution, regardless of the exercise of due care or the use of the ordinary precautions employed by his profession. Nowhere was the jury informed that the liability of the dentist-defendant depended on proof that he had *negligently* used an unsterile needle or solu-

tion. This error was not overcome by other instructions. The judgment of the trial court was therefore reversed.—Medicolegal, *J. A. M. A.*, May 23, 1931.

NEWS

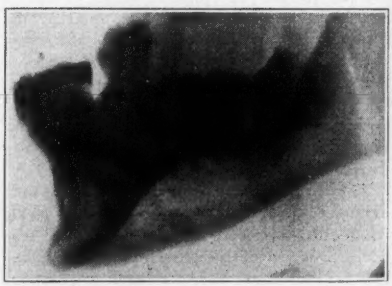
Michigan State Dental Society Officers: Following are the officers of the Michigan State Dental Society for the year 1931-1932: president, R. E. Patterson, Detroit; president elect, Ward Moore, Grand Rapids; vice president, M. Webster Prince, Detroit; secretary, William R. Davis, Lansing; treasurer, E. J. Chamberlain, Grand Rapids.

Berlin to Receive Gift of Clinic: It is announced that Berlin will receive the sixth million dollar European dental clinic for children, the gift of Julius Rosenwald, Chicago merchant philanthropist, who has taken this step after the example of George Eastman, Rochester, N. Y., philanthropist, and donor of clinics in London, Rome, Stockholm, Paris and Brussels. Harvey J. Burkhart, of Rochester, has been in Berlin recently acting as agent for Mr. Rosenwald.

Dental Caries Revealed by Airplane Flights: Dr. Garsaux, head of the medical service of the aerodome at Bourget, near Paris, has noted several instances of dental pain in aviators, which developed during an airplane flight. The pain was in or near the large molars, which caused no disturbance while the aviators were on the ground. It was a question of unsuspected caries, with granulomas about the roots and small gas abscesses that became distended under the influence of the different atmospheric pressure. The teeth appeared to be intact and the fillings did not show fissures or the slightest communication with the outside. But, as the atmospheric pressure diminished with the greater elevation of the airplane, the pressure of the gas confined at the base of the roots increased and caused an irritation of the nerve fibers. This nervous irritation produced sometimes a state of dizziness, which does not occur during an airplane flight in a perfectly healthy person.—Paris letter, *J. A. M. A.*, May 30, 1931.

Survey Shows Interest in Panel Dentistry and Children's Dentistry: That the two subjects foremost in the minds of the dental profession are (*a*) panel dentistry and (*b*) children's dentistry is indicated by early returns from a survey now being made by the Guild Research Bureau of New York City for Ritter Dental Manufacturing Company. A questionnaire referring to these two important subjects was sent out by that organization late in June to approximately 5,000 dentists throughout the United States and Canada. To date, approximately 2,000, or nearly 40 per cent, have responded, and returns are still coming in. The replies from dentists in many cases are acompanied by letters supplementing the opinions expressed on the questionnaires. Twelve to 20 per cent is the normal expectancy of returns from surveys of this kind, according to the Guild Research Bureau, a professional research organization. The fact that twice that number responded to this questionnaire is taken as an indication of the wide interest in the subjects. Replies are now being studied and answers tabulated. As soon as this work is completed, the results will be given wide publicity.

DENTAL ANOMALY



Fourth molar fused to third molar. (From the practice of Charles E. Allen, Brocton, N. Y.)

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Dental Association, Memphis, Tenn., Oct. 19-23, 1931.

American Academy of Periodontology, Memphis, Tenn., Oct. 15-17, 1931.

American Dental Hygienists' Association, Memphis, Tenn., Oct. 19-23, 1931.

American Dental Assistants Association, Memphis, Tenn., Oct. 19-23, 1931.

American Full Denture Society, Memphis, Tenn., Oct. 16-17, 1931.

American Society of Oral Surgeons and Exodontists, Memphis, Tenn., Oct. 16-17, 1931.

International Stomatologic Congress, Budapest, Sept. 2-7, 1931.

Chicago Dental Society, January 18-21.

Committee on Costs of Medical Care, Washington, D. C., September 17-24.

Greater New York, New York City, November 30-December 4.

Kings County Dental Society of Brooklyn, N. Y., February 25-27.

Montreal Dental Club, October 15-17.

National Association of Dental Examiners, Memphis, Tenn.,. October 17.

New England Dental Society, Boston, Mass., October 8-10.

Odontological Society of Western Pennsylvania, Pittsburgh, November 18-20.

Society for Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

Southern Society of Orthodontists, Cincinnati, Ohio, December 1-3.

Southwestern Dental Society, Albuquerque, N. M., October 13-15.

St. Louis (Mo.) Dental Society, December 7-9.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

October

New Mexico, at Albuquerque (13-15).

December

Ohio, at Cincinnati (1-3).

April

Michigan, at Detroit (11-13).

May

New York, at Albany (11-13).

STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, December 14. Bert Boyd, Secretary, 610 South Broadway, Los Angeles.

Indiana, at Indianapolis, November 16-19. J. M. Hale, Secretary, Mt. Vernon.

New Jersey, at Trenton, December 7-12. John C. Forsyth, Secretary, 148 W. State St., Trenton.

Wisconsin, at Milwaukee, December 14-18. S. F. Donovan, Secretary, Tomah.

MICHIGAN STATE DENTAL SOCIETY

The seventy-sixth annual meeting of the Michigan State Dental Society will be held at the Statler Hotel, Detroit, April 11-13.

WILLIAM R. DAVIS, *Secretary,*
Michigan Department of Health,
Lansing.

WISCONSIN STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Wisconsin State Board of Dentistry will be held at Marquette University, Department of Dentistry, Milwaukee, December 14-18, for the purpose of examining applicants to practice dentistry.

S. F. DONOVAN, *Secretary,*
Tomah.

OHIO STATE DENTAL SOCIETY

The sixty-sixth annual meeting of the Ohio State Dental Society will be held at the Netherland Plaza Hotel, Cincinnati, De-

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

cember 1-3. The Southern Society of Orthodontists will hold its meeting jointly with the Ohio State Society.

EDWARD C. MILLS, *Secretary,*
255 East Broad St.,
Columbus.

GREATER NEW YORK DECEMBER MEETING

The seventh Greater New York December Meeting will be held at the Hotel Pennsylvania, New York City, November 30-December 4. The meeting this year has been dedicated to children's dentistry. The initial session will be a joint meeting of the medical societies of the five boroughs of Greater New York together with the First and Second District Dental societies.

JOHN T. HANKS, *Chairman.*

Adler Hotel, Memphis

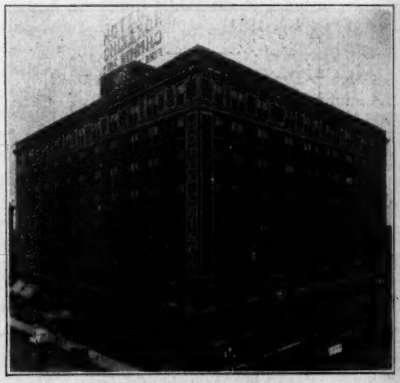
INDIANA STATE BOARD OF DENTAL EXAMINERS

The Indiana State Board of Dental Examiners will meet in the House of Representatives Room of the State House, Indianapolis, November 16, at 8 a. m., for the purpose of conducting an examination of all applicants for licensure in Indiana who come with proper credentials and are accepted for examination. All applications should be in the hands of the secretary one week before the meeting. The examination will probably last four days. For applications, clinical requirements and other information, address

J. M. HALE, *Sec'y-Treas.,*
Mt. Vernon.

KINGS COUNTY DENTAL SOCIETY OF BROOKLYN

The Kings County Dental Society of Brooklyn will celebrate its twentieth anniversary at the Hotel St. George, Brooklyn, February 25-27, with a program of clinics, lectures and table and topic discussions, closing the meeting with a dance Saturday night, February 27.



Hotel Chisca, Memphis

MATTHEW D. LEVIN, *Chairman,*
Publicity Committee,
201 Eastern Parkway,
Brooklyn.

NEW JERSEY BOARD OF REGISTRATION

The State Board of Registration and Examination in Dentistry of New Jersey will hold its regular examinations at Trenton, commencing Monday, December 7 and continuing for five days thereafter. The examination fee is $25; reexamination fee, $10. Attention is invited to the following quotation from the dental law of New Jersey: "Applicant shall present to said board a certificate from

the commissioner of education of this state, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study in an approved high school or the equivalent thereof." In accordance with this law, the secretary will issue application blanks only on presentation of the required certificate from the commissioner of education, State House, Trenton. Application must be filed complete ten days before the date of examinations (November 27). Address all communications for further particulars to

JOHN C. FORSYTH, *Secretary,*
148 W. State St.,
Trenton.

Hotel Claridge, Memphis

BOARD OF DENTAL EXAMINERS OF CALIFORNIA

The Board of Dental Examiners of the State of California will conduct examinations in San Francisco beginning December 14. The credentials of all applicants must be in the office of the secretary of the board at least twenty days prior to the above mentioned date. For particulars, address

BERT BOYD, *Secretary,*
610 South Broadway,
Los Angeles.

Elks Hotel, Memphis

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

The Odontological Society of Western Pennsylvania will celebrate its fiftieth anniversary as the Odontological Society and the seventy-second year of organized dentistry in Western Pennsylvania at a meeting to be held November 18-20 at the William Penn Hotel, Pittsburgh.

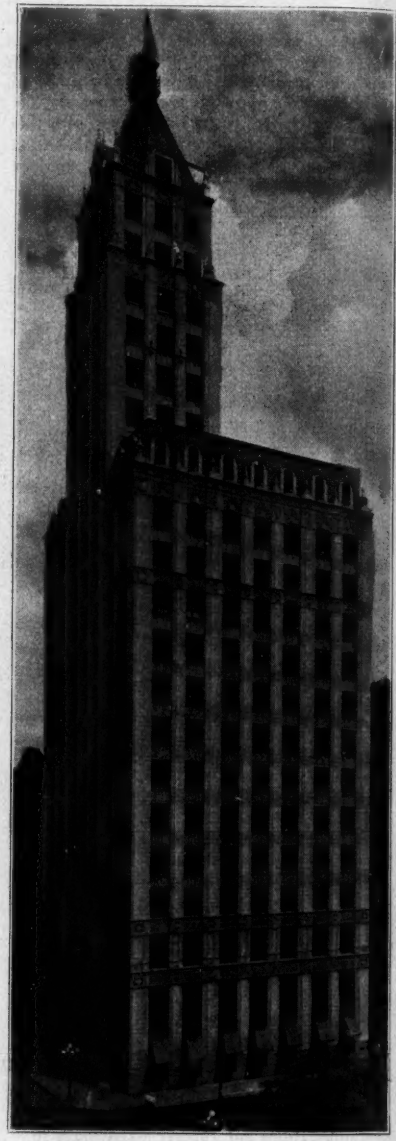
W. EARLE CRAIG, *Secretary,*
Jenkins Arcade,
Pittsburgh.

ST. LOUIS DENTAL SOCIETY SEVENTY-FIFTH ANNIVERSARY MEETING

The St. Louis Dental Society will observe its seventy-fifth anniversary by a meeting at Hotel Jefferson in St. Louis, December 7-9. Smaller societies in and around St. Louis are invited to attend and facilities will be provided for a joint meeting with us. A manufacturers exhibit will be held simultaneously with this meeting.

RUSSELL C. WHEELER, *Chairman,*
Publicity Committee,
University Club Bldg.

Sterick Building, Memphis



Columbian Mutual Tower, Memphis

Rainbow Lake, Overton Park, Memphis, Tenn.

AMERICAN DENTAL ASSOCIATION

Memphis, Tennessee. October 19-23, 1931.

HOTEL RESERVATION

In securing hotel reservations for the 1931 Session, consult the hotel rate-sheet and fill out the blank application below. Mail immediately to the hotel you wish to patronize. The hotel will then advise you of the reservation which has been made for you.

As your first choice may not be available, kindly indicate a second and a third choice. If none of these are available, the hotel manager will mail your application to the Chairman of Halls and Hotels Committee, who will make a reservation for you again in as favorable a hotel as possible.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed on, please write or wire the hotel, releasing it, in order that your room may be available for other members.

MAIL THIS APPLICATION DIRECT TO THE HOTEL

HOTEL RESERVATION

AMERICAN DENTAL ASSOCIATION, MEMPHIS, TENNESSEE, OCTOBER 19-23, 1931

.....Hotel. .....1931.

Memphis, Tenn.

Please reserve sleeping room accommodations as noted below:

.....Room (s) with bath for.....people. Rate desired $.....
(per day)

.....Room (s) without bath for.....people. Rate desired $.....
(per day)

Second choice hotel.....

Third choice hotel.....

ROOMS TO BE OCCUPIED BY: ADDRESS IN FULL

Applicant..... .....

....

....

Please confirm this reservation to applicant. I further agree to notify the hotel at once in the event I am unable to use this reservation.

IMPORTANT TO HOTEL MANAGER: In the event you cannot accept this reservation, please forward this application at once to Dr. E. F. Simpson, Chairman Halls and Hotels Committee, 735 Sterick Bldg., Memphis, Tenn., who will attend to the assignment of this reservation.

HOTEL	Single Room with Bath	Double Room with Bath	Single Room without Bath	Double Room without Bath
ADLER 73 Linden Ave.	$2.00 & up	$3.50 & up 5.00 & up (twin beds)	$1.50 & up	$2.50 & up
AMBASSADOR 347 S. Main	2.00	3.50	1.50	2.50
CATHOLIC CLUB 185 Adams			1.25	2.00
CHICKASAW 99 S. Main			1.00	1.50
CHISCA 270 S. Main	2.00 & up	4.50 & up 5.00 & up (twin beds)	2.00 & up	3.50 & up
CLARIDGE 109 N. Main	3.00 & up	4.50 & up		
DESOTO 154 E. Calhoun			1.25	2.00
ELK'S 69 Jefferson	3.00-3.50	4.00-5.00 5.00-6.00 (twin beds)	2.00-2.50 Con. bath	3.00-4.00 Con. bath
FOREST PARK 855 Union	2.00	2.50	1.00-1.50	1.50-2.00
GAYOSO 139 S. Main	3.00 & up	5.00 & up	2.00 & up	3.00 & up
HERMITAGE APTS. 200 Union	1.50	2.75	1.00	1.75
WM. LEN 110 Monroe Ave.	2.50 & up	4.50 5.00 (twin beds)		
LONGINOTTI S. Main St.			1.00	1.50
PARKVIEW 1914 Poplar	3.50	5.00-6.00		
PEABODY HOTEL 149 Union	3.50 & up	5.50 & up 7.00 & up (twin beds)		
PLAZA 214 Calhoun	2.00	3.00	1.50-2.00	2.50-3.00
POLK APTS. 630 Madison	2.00	2.50-3.00		
PONTOTOC 69 Pontotoc	1.50	2.00	1.00	1.50
TENNESSEE 80 S. Third St.	2.00 & up	3.00 & up		
WINONA 110 E. Calhoun	2.00	3.00	1.00-1.50	2.00-3.00
WALDORF S. Main St.	1.50	2.00	1.00	1.50

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1930-1931

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